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# ***JPRS Report***

## **Science & Technology**

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***USSR: Life Sciences***

# Science & Technology

## USSR: Life Sciences

JPRS-ULS-91-024

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### Lack of Progress in Organizing Radiation Zone Research

917C0386A Moscow RABOCHAYA TRIBUNA  
in Russian 7 Feb 91 p 4

[Article by A. Volvachev and A. Mikhchalchuk, Belorussian News Agency correspondents for RABOCHAYA TRIBUNA, Minsk: "An Extraordinary Situation: Sanctuary, Zone, or Proving Ground?", first paragraph is RABOCHAYA TRIBUNA introduction]

[Text] A document was signed on 24 February 1988 dealing with the establishment of the Polesskiy State Ecological-Radiation Sanctuary of the Belorussian State Environmental Committee. This is an area of 142,800 ha surrounded by a barbed wire fence in the Belorussian sector of the 30 km zone around the Chernobyl Nuclear Power Plant.

The term, *sanctuary*, is perhaps not the optimum one in this case. There is nothing unique with respect to animal and plant kingdom, or geological features in this area. The distinctive feature of this region is something else, it is the unusually broad spectrum of radionuclides, including long-lived isotopes that fell out in profusion in the area after the explosion of the reactor. Cesium, strontium, plutonium, cerium.... You name it, all of the Mendeleyev table listings can be found there!

It would seem that this should be of interest to scientists. For example, how do radionuclides behave in the air, soil, water? How do they affect animals and vegetation? After all this is an extremely important matter. We should learn how to organize ecological protection against radiation, preclude migration of radioactive particles in water and dust and, perhaps, we would then be able to thwart the disaster menacing the health of thousands and thousands of people. Moreover, what research findings will turn out to be literally unique and priceless?

V. Fedorov, deputy scientific director of the sanctuary states: "Last year we suggested that the republic's council of ministers organize a scientific-production enterprise in this zone. We were supported by the Institute of Radiobiology. But the proposal was held up on the government level. The republic's administration probably had more important problems."

Thus, virtually nothing was accomplished in the sanctuary in two years. It was not adequately manned, has neither equipment nor facilities. Moreover, even the statute concerning the sanctuary has not been approved, and for this reason neither its purpose nor competence are clear. It turns out that the zone is not being protected. Whose territory is it?

"Legally, this land has not yet been approved as a sanctuary," explains Z. Muravyev, chief of the inspection department of the Belorussian State Environmental Committee. "The matter is literally blocked against the fence erected along the boundaries of the sanctuary. Neither the oblast polkom [oblast executive committee] nor military builders have ever submitted estimates for the sanctuary to us. The promised firebreak was not built."

The bureaucratic delays are familiar. The Ministry of the Forestry Industry has refused to accept the zone. The State Environmental Committee did not accept it legally. Science has not yet really delved into this no-man's-land, although the Belorussian Academy of Sciences should coordinate research at its expense.

Incidentally, this is not true. Scientists do show up at the sanctuary. For several years now, samples have been collected by the Pripyat NPO [scientific-production association] of the Ministry of the Nuclear Power Industry. But for what purpose? What is being done with the results, to whom are they transmitted (or sold)? Isn't it strange that the Union's Ministry of the Nuclear Power Industry is carrying out some sort of work in the area related to the consequences of radioactive contamination, but it is not clear what instructions were issued or who issued them.

At one time, there was a conversation between that department and the republic's council of ministers about handing over the zone. Representatives of the ministry agreed to take only part of it, the "dirtiest" sector. Perhaps there would have been some sort of agreement, but the outcome of the negotiations was predetermined by the Gomel oblast polkom. It categorically refused to "reassign" its territory to the ministry, as if to say that "even if it is tainted, it is our land, and we alone should decide what to do with it."

We can sympathize with the Gomel administrators. Departments are by no means masters of earth. Chernobyl is the most terrifying proof of this. Ultimately, no matter how blasphemous it may sound, there could be profit from this zone. Even now, partners and contractors abroad are interested in the possibility of carrying out research, developing and testing original technologies on naturally occurring radioactive proving grounds, as well as special procedures and equipment for nuclear energy. It is apparent that our research there could be commercially advantageous (this sounds cynical, but it can't be helped).

However, do we have such scientific "merchandise"? We do, to some extent, in the opinion of A. Bogdanov, head of the radiometry and dosimetry laboratory of the Institute of Radiobiology, Belorussian Academy of Sciences. But we have no experience in selling it. For example, how can one assess our developments in terms of dollars? Thus far, such questions are cropping up, and information gained in the zone is pumped out gratuitously, free of charge.

In general, it is difficult to comprehend the position of Belorussian science administrators, that very Academy of Sciences, as research coordinators. We do not see it striving to establish direct contacts with colleagues for the purpose of contractual action. The matter does not go beyond an exchange of information.

Yet the information obtained in this zone is extremely disparate. The Belorussian Hydrometeorological Service is responsible for quantitative monitoring; the Ministry of Health and Institute of Radiation Medicine are concerned with the medical aspects of the problem, while the Western Department of the All-Union Academy of Agricultural

Sciences imeni Lenin deals with the management of agriculture in contaminated regions. There is no concentration in a single center. In essence, there is no unified scientific program, although there is a science section in the State Union Republic program for eradication of the sequelae of the Chernobyl accident. Unfortunately, there is no coordination. Yet individually, no single department in our country is capable of independently solving such a global problem at this stage.

Who hires which contractors at the present time? Perhaps the specialized enterprises of the former Sredmash [Central Machine-Building Plant] and Ministry of the Nuclear Power Industry were able to accomplish the most with respect to organization of applied research. In their plans, Belorussian Academy institutes emerge as contractors, executors of some, but not the most important directions. And so it is feared in Belorussia that the Belorussian Academy of Sciences would not be able to become its co-owner of the developments. This fear is based on the fact that it is not deemed to inform this republic about the results of the entire spectrum of research.

Recently, one more plan was discussed by this republic's council of ministers for establishing a special forestry industry within the 40 km zone, which would deal with afforestation and monitor this territory.

In a conversation, I. Lishtvan, vice-president of the Belorussian Academy of Sciences, told us: "If the decision to form such a structure is approved, we shall also approve

our unified scientific program. I assume that the forestry industry would be in closer contact with the Pripyat NPO. But generally speaking, organizations of all three republics, the Ukraine, Belorussia and RSFSR should implement the science section of the State program for Chernobyl. Our academy is not in a position to develop all of the new technologies. There is nothing wrong with someone using our specialists in the interests of the cause."

Efforts to end the lack of coordination between agencies and organizations dealing with research in the zone have been ineffective thus far. After several reorganization measures the idea occurred of having an intersector scientific-technological complex which would concern itself with the development of special procedures and equipment, and special technologies for decontaminating radioactive areas. Hard currency gained from selling them could cover, to a large extent, the expense of eradicating the sequelae of the accident.

It could.... But so far all we have are plans and good intentions. As for concrete action, we are merely marking time. It is very strange that both the government and the Belorussian Supreme Soviet have only heard through rumors about the existence of such departmental programs as "Sanctuary," "Proving Grounds," "Utilization," "Rehabilitation," and others.

Can it be that each organization must have its own, rather than common, interests in this "protected" zone?

## Occupational Pathology Centers Essential to System of Improving Employee Medical Care

917C0543A Moscow GIGIYENA I SANITARIYA  
in Russian No 2, Feb 91 pp 1-3

[Article by V. B. Pankova, T. B. Popova, and V. N. Ozhiganova, Scientific Research Institute for Hygiene of Labor and Occupational Diseases, USSR Academy of Medical Sciences]

UDC 613.62:008(47+57)

[Text] In spite of significant advances in hygiene science and practice, sanitary-hygiene standards are not observed at all times or in all places.

According to data from complex plans for improving working conditions and sanitary improvement measures, and according to results of work place certifications as of January 1, 1988, more than five million work sites did not meet standards and rules for occupational safety. This results in occupational diseases and poisonings and facilitates a rise in morbidity and temporary disability. During the last 10 years alone, there were more than 137,600 first-time victims of industrially-caused problems.

Occupational morbidity rates have been decreasing for more than twenty years, but in recent years they have again begun to rise. Thus, in 1985 there were 10,384 cases, 11,008 in 1986, 11,236 in 1987, and 11,872 first-time cases in 1988. Considering the number of people working under hazardous conditions, this index is 12 cases per 10,000. However, these figures do not indicate the true picture. Medical examinations conducted by specialists at industrial hygiene and occupational diseases institutes in various regions reveal a much greater number of victims.

However, in view of the lack of a unified system in the country for registering occupational diseases and occupational disability cases, we do not currently have reliable and exhaustive information available on the total number of people affected.

The social and economic significance of occupational disease morbidity must be fully considered. Occupational diseases affect the working population, including highly skilled apprentices, which inflicts substantial economic losses on the national economy.

Thus, economic losses from each case of pneumoconiosis or vibrational disease cost the state 17.5-25,000 rubles per year. Chronic mechanic bronchitis costs 34,000 rubles per year (this is only compensation for work disability). If we take into account the cost of treatment, medical service, and other costs rising from the occupational disease, this figure increases significantly.

Prophylactic (preventive and regular) medical examinations (PRME) of individuals working under hazardous conditions play an important role in occupational disease prophylaxis, in addition to technological, engineering, and hygienic measures.

However, as research results and analysis of data obtained from 16 industrial hygiene and occupational diseases scientific research institutes demonstrated, in spite of the high (almost complete) PRME of employees, there were serious shortcomings in the quality of these PRMEs. In the first place, this is due to inadequate training of the workshop therapists in the districts and other medical employees that perform the examinations in the field of industrial hygiene and occupational pathology. It is also due to an unsatisfactory equipment and diagnostic base in the medical establishments. The PRMEs are frequently performed with an incomplete staff of specialists, and without the use of auxiliary objective functional methods that are designed to identify the earliest signs, preclinical forms, and stages of occupational diseases. As a result of all of this, the occupational diseases are either not completely identified or are identified very late. Rather pronounced forms of disease that result in temporary and permanent disability are diagnosed.

The quality of the professional training of the specialists in these matters is suffering due to the absence of a very important specialty, occupational pathology, from the nomenclature of medical specialties. Very little time is spent in the higher school on problems of occupational pathology, and post-graduate training in occupational pathology is not actively being conducted in the departments and institutes for the advanced training of physicians.

At the same time, occupational pathology as a clinical specialty has specific aspects in contrast to the general clinical picture.

The variety and unique nature of hazardous factors in the industrial environment, their different combinations and physical and chemical properties, and the variety of ways of affecting the body and other factors govern the aspects of occupational disease and the structure of occupational morbidity. Special methodical approaches are needed to solve problems of occupational disease diagnosis.

The main feature of occupational pathology is its close relationship with hygiene sciences and primarily industrial hygiene. The correct diagnosis can only be made with specific knowledge of occupational hazards (and the incidence of their factors), to which the victim was exposed. Without evaluating the condition of the work environment and the industrial process, an informed diagnosis of occupational disease is not possible. An inadequate knowledge or ignorance of the victim's labor conditions results in incorrect conclusions and diagnostic errors when an illness that is clearly job-related is perceived to be unrelated to labor conditions, and vice-versa.

Insufficient knowledge of problems of occupational and general pathology leads to errors in diagnosis and frequently generates conflicting situations. Often these conflicting situations are related to violations of deontology guidelines by the general physicians, when they prematurely and without proof inform the patient that his disease is job-related. Making a diagnosis of occupational disease

that will involve material compensation by the government is a very serious matter. Hyperdiagnosis inflicts unjustified material damage to factories and the government, and psychological trauma on the patient, and results in changes in his personality and the development of litigious patterns and income devices.

Modern forms of occupational disease are poorly pronounced and effaced, often with a torpid course with slow progression and, in most cases, little effect on physical work ability. This makes it possible to orient patients with occupational diseases to a wide array of professions. However, this is only possible with correct, goal-oriented rehabilitation, preceded by skilled expertise of physical fitness. Gross errors in determining groups of occupational diseases are still being made, and disabled individuals often do not show up for regular check-ups, are not treated, and remain disabled for a long time without reason. They receive substantial material compensation from the plant, and do not use their ability to work. The development of specialized VTEK [as published] consulting centers in this connection is promising.

An important aspect of preventing work disability is improving the public health clinic system for patients with occupational diseases.

General problems in the organization of public health, as well as the financing of medical science and practice according to the residual principle result in serious shortcomings in the prophylaxis of occupational diseases.

It should be mentioned that according to an order by the USSR Ministry of Health and an initiative of local agencies, public health clinics, hospitals, departments, offices, and centers for occupational pathology were created in various regions of the USSR in 1978. By 1989, nine centers of occupational pathology were officially operating in the country. An analysis of the operation of the Ufa, Sverdlovsk, Novokuznetsk (on the base of profile scientific research institutes), Riga, Minsk (on the base of medical institutes), Voronezh, and Chelyabinsk (on the base of municipal and oblast hospitals) centers, in spite of certain differences, demonstrated the effectiveness of their activity: they obtained reliable and exhaustive information on occupational morbidity, improved the diagnosis of occupational diseases, increased the number of employees given PRMEs and the quality of these examinations, improved rehabilitation work, etc.

However, these establishments for occupational pathology care unfortunately did not radically improve specialized care to the employees, that is, they did not have permanent, qualified, organized or methodical direction, and a combined occupational pathology service was not established.

In connection with this, the colleagues of the USSR Ministry of Health approved a number of specific resolutions for radical improvement of this work on October 5, 1989. These resolutions included the creation of an All-Union Center for Occupational Pathology at the Scientific Research Institute for Industrial Hygiene and Occupational Diseases, USSR Academy of Medical Sciences, and

the establishment of republic, kray, and oblast centers for occupational pathology. Improvement in the training of specialists in performing PRMEs and measures for improving the treatment and rehabilitation of occupational pathology patients are planned.

These resolutions are also reflected in the USSR Ministry of Health resolution dated September 29, 1989, "Improving prophylactic examinations of employees and drivers of individual transportation systems." It is a set of documents that regulate and make recommendations on matters of performing preliminary examinations and PRMEs, and the treatment of patients with various forms of occupational diseases. The resolution contains a list of occupational diseases, samples of various forms of documentation, and also the "Statement on the occupational pathology center (republic, kray, oblast, municipal)." The All-Union Center for Occupational Pathology (AUOP) and the Central Expert Commission at the base of the Scientific Research Institute for Industrial Hygiene and Occupational Diseases, USSR Academy of Medical Sciences govern this resolution. The AUOP was created to coordinate activity of the territorial centers and also offer them consultation help.

The base for establishing the territorial centers for occupational pathology are governed by the republic ministries of public health depending on the needs of the region.

The chief tasks of the centers for occupational pathology are:

- create a data bank on occupational morbidity, disability, and mortality of patients with occupational diseases;
- offer qualified public health clinic care to individuals suffering from occupational disease, including those with the early, clinically poorly expressed forms of occupational diseases, and those at high risk for developing occupational diseases;
- expertise and establishment of the presence (lack) of occupational disease (relationship between disease and occupation);
- develop and implement prophylactic measures for early detection, public health clinic observation, treatment, and rehabilitation of patients with occupational diseases;
- resolve complex expert and conflict situations that arise in conducting the essential preliminary examinations and PRMEs;
- offer practical assistance to public health establishments in performing the PRMEs;
- put into practice new methods of prophylaxis, diagnosis, and treatment of occupational diseases;
- organization-methodical work on enhancing the skills of medical personnel at the centers for occupational pathology and therapeutic prophylactic establishments that offer medical care to employees;
- send individuals with persistent work disability to the VTEK consultation centers;

—along with the sanitation and epidemiological service, develop proposals for environmental protection, improving labor conditions, and preventing occupational diseases and poisonings at plants.

The centers for occupational pathology have the right to send patients to the AUOP or Central Expert Commission for consultation in order to resolve particularly difficult differential diagnostic and debatable matters in conducting the PRMEs or when establishing a relationship between the disease and the occupation. They must express their stance and conclusion in the accompanying documentation.

The structure of the centers for occupational pathology is determined by the base as well as the demands of the region, but it must have a polyclinic, and organization-methodical, statistical, and laboratory-functional subunits.

The polyclinic may include diagnostic, public health clinic, and PRME departments to satisfy its tasks.

The centers for occupational pathology use other therapeutic and prophylactic establishments and their subunits, in a given order, in the manner in which they were established to carry out the mutual relationship and exchange of information with the respective sanitary and epidemiological stations (municipal, oblast, republic).

New forms of economic relations (team contract, rent, contract relations) makes it possible for the centers for occupational pathology to use material stimulation of their colleagues, as well as strengthen their own material and equipment base. This is reflected in a resolution of the Communist Party Central Committee and USSR Council of Ministers dated November 19, 1987, which outlines the means for partial compensation of expenses for conducting PRMEs, treatment, and examination of employees for the plants, establishments, organizations, collective farms, and state farms.

Thus, the creation of centers for occupational pathology is a new step towards improving medical care for employees, and may be viewed as the first stage in creating an industrial medicine service.

### Conclusions

1. There is an urgent need to improve medical care for employees, an important step in the creation of a network of territorial centers for occupational pathology.
2. The chief tasks of the centers of occupational pathology are: to create a reliable data bank on occupational morbidity in the country, offer consultation and methodical assistance, and improve therapeutic-rehabilitation work and training of personnel in occupational pathology.
3. There is an acute need for introducing the specialty of occupational pathologist into the nomenclature, particularly as a specialist in the first step of coordination and effective work in occupational disease prophylaxis.

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### Methodical and Instrumental Support for Two-Step Gravimetric Measurements of Dust Concentration

917C0543C Moscow GIGIYENA I SANITARIYA  
in Russian No 2, Feb 91 (manuscript received  
11 May 90) pp 40-42

[Article by V. V. Tkachev and V. I. Turubarov, Scientific Research Institute for Industrial Hygiene and Occupational Diseases, USSR Academy of Medical Sciences, Moscow; Institute of Aviation Instrument Engineering, Leningrad]

UDC 615.471.03:613.633-07

[Text] One of the most important indicators of the fibrogenic properties of industrial aerosols is the size of the aerosol particles.

In order to facilitate comparison of inertial and gravitational settling, random particle sizes are usually expressed through the equivalent sizes of spherical particles. The hypothetical unit, called a "reduced aerodynamic diameter," which simultaneously calculates the size, density, and form of the particle, is most commonly used. The difference between the projection (real) diameter and the aerodynamic diameter may be very substantial. For example, if the projection diameter of a quartz particle measured under a microscope is 5  $\mu\text{m}$ , its reduced aerodynamic diameter [4] may be  $d_a = d_p \times q^{1/2} = 5 \times 2.65 = 8.1 \text{ m}$ , where  $d_a$  is the reduced aerodynamic diameter;  $d_p$  is the projection diameter,  $\mu\text{m}$ ; and  $q$  is the quartz density,  $\text{g/cm}^3$ .

If it is a lead particle, the  $d_a = 5 \times 11.33^{1/2} = 16.8 \mu\text{m}$ . Usually the projection diameter of the particles is determined based on micrometer measurements and then all of the particles in question are separated by fractions. After estimating the number of particles that are in a given fraction, we determine their fraction in percents of a total number. The greater the magnification of the microscope, the greater the number of smaller particles that are counted in the analysis, which elevates their number and respectively decreases the percent content of large particles. Recalculation of the number of particles of a certain size and form in their total mass with the basic indices of the function of redistribution does not theoretically present a problem [4]. However, in practice it is only possible when the particles of a given form consist of one and the same substance of a given density. If the aerosol particles consist of different substances (quartz, mica, iron, lead, etc.), then the number of particles in their mass can only be calculated when the amount of particles of a given composition in each fraction is known. Obtaining this information is very difficult in practice.

Some of the aerosol that swirls in the air are aggregates of several "agglutinated" particles. The aggregates behave very similarly to particles in the air that have the respective aerodynamic size, rather than like the particles of which the aggregates are composed. Most of the modern methods of dispersion analysis include isolation from the gaseous environment of the weighed quantity of aerosol and its particles that are dispersed in liquid or gas to

determine the size of the particles. With repeat dispersion, the first aggregate state of the aerosol cannot be reproduced [4]. In order to correctly assess the biological effect of the aerosols, it is important to know the dispersion composition, taking into account the aggregate condition of the particles in their natural form, so that evaluation of the aerosol kinetics in the human body is as reliable as possible.

Data on the connection between the size of the inhaled particles and their retention and deposition suggest the importance of gravimetric readings of the fractional composition of industrial aerosols [3, 7]. We obtained this information as a result of direct two-step measurements with the use of the SPG-210 dust collector ("Myutron" Company). Separation of the particles and aggregates in the cyclone dust separator of the two-step dust collectors and dust meters, as well as their primary retention in the respiratory tract, is governed by the aerodynamic diameter [8]. The results of the measurements [1] suggest that the amount of the small fraction in all of the airborne dust in mining plants (underground operation), ceramic, and casting industries in individual samples reached 90 percent in mass, and in other cases dropped to 1 percent (the average was 8.37 percent).

A large volume of two-step measurements of the dust content in the air of work sites in place and other mines in the Soviet Union [5, 6, 9] made it possible to obtain new data on the dispersion and substance composition of mining dust that is extremely important to the hygienic assessment of the dust factor. We established for the first time that the dispersion composition of mining dust in the execution of various technological operations may substantially differ. It is also important that the content of free silicon dioxide in all of the airborne dust is usually higher than in its finer fractions, sometimes by 2-fold or more. Consequently assessment of the fibrogenic properties of industrial aerosols in free silicon dioxide in airborne dust may be inaccurate and decrease health standards without substantiation.

The two-step measurements made it possible to more accurately evaluate the dust factor based on current standards in various countries and the maximum acceptable levels of fibrogenic dust in our country. The results of such comparisons suggest that the lack of equipment to control dust and higher concentrations of dust in the air at the work site (more than  $10 \text{ mg/m}^3$ ), and the concentration of all airborne dust may be regulated, but with lower maximum acceptable levels, it is perhaps less rigid in the USSR in comparison with capitalist countries. For example, when drilling holes our maximum acceptable level was exceeded by 1.7-fold, while it exceeded standards in the USA, Canada, Italy, and other countries by 2.5-fold. During small tap hole drilling in refining workings, we met the maximum acceptable level, but the standard in the above listed countries was surpassed by 1.7-fold. We must take into account the fact that the standards in capitalist countries and some East European countries (Czechoslovakia, Hungary, etc.) permit a 5 percent risk for pneumoconiosis disease during 35 years of work [2].

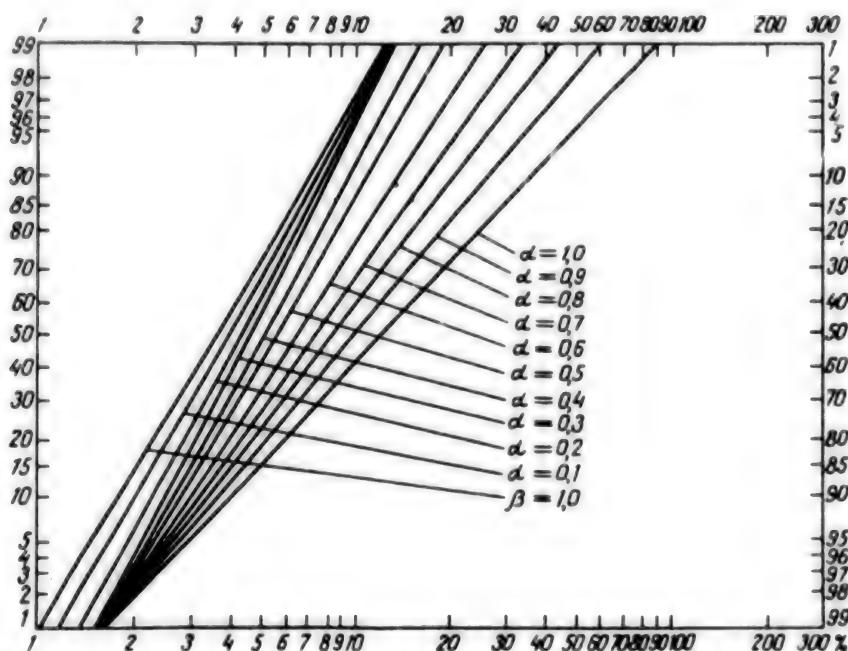
Data from the conductimetric analysis of hundreds of dust samples using an electronic particle counter "Culture Counter", model TA 2 ("Cultronics", France) convincingly suggest that the distribution of particles by size in the small and large fractions of mining dust well approximate the normal law logarithmically. Moreover, there is a reliable and substantial difference in the distribution of particles. The average mass-median diameter of the large fraction is  $11.7 \mu\text{m}$  ( $10-13.2 \mu\text{m}$ ), while that of the small fraction is  $3.6 \mu\text{m}$  ( $2.6-4.4 \mu\text{m}$ ). The geometrical standard deviation of the small fraction is 1.7, and 2.35 for the large fraction. There are almost no  $15 \mu\text{m}$  particles in the small fraction, and the content of particles more than  $10 \mu\text{m}$  in diameter fluctuates from 1 to 6 percent (average of 2.5 percent). For more than  $5 \mu\text{m}$  the range is 15-40 percent (26 percent), and for more than  $2 \mu\text{m}$  it is 74-92 percent (85 percent). In the large fraction, the content of particles more than  $100 \mu\text{m}$  in diameter ranges from 0 to 1 percent, more than  $50 \mu\text{m}$  from 3 to 7 percent (4.5 percent), more than  $20 \mu\text{m}$  from 29 to 34 percent (30 percent), more than  $10 \mu\text{m}$  from 50-64 percent (58 percent), more than  $5 \mu\text{m}$  from 79-88 percent (85 percent), and more than  $2 \mu\text{m}$  from 97-99 percent (98 percent).

The research results made it possible to develop a theoretical model for the rapid calculation of the dispersion composition of mining dust particles using the results of the two-step gravimetric measurements of the concentration of all dust. In the mining aerosol, the distribution of particles by size in the small and large fractions within certain limits is constant, but the amount of these fractions by mass in all airborne dust changes substantially. On the basis of this theoretical model, a formula was derived which made it possible to determine the amount by the mass of particles of any size that were among those being measured. In order to simplify calculations, a nomogram was constructed for the rapid calculation of the dispersion composition of the mining aerosol (see Figure). In order to determine the dispersion composition of particles in the mining aerosol, it is sufficient to calculate the size of  $a$ , dividing  $c_1$  by  $c_0$ , where  $c_0$  and  $c_1$  are respectively the concentration in the mass of all airborne dust and its large fraction.

**Sample calculation:** When drilling tap holes with a hand-held hammer drill in a cleaning block, the concentration of large dust  $c_1 = 1 \text{ mg/m}^3$ , and the concentration of small dust is  $c_2 = 0.5 \text{ mg/m}^3$ . We believe that in order to determine the amount of particles retained for the first time in the respiratory tract of the drill operator, we need to determine the concentration of particles up to  $5 \mu\text{m}$  in diameter, from  $5.1$  to  $10 \mu\text{m}$ , from  $10.1$  to  $20 \mu\text{m}$ , from  $20.1$  to  $50 \mu\text{m}$ , and more than  $50 \mu\text{m}$ . Then  $a = 1.0 / 1.5 = 0.667$  (approximately 0.7).

Then on the nomogram (see Figure) for  $a = 0.7$  we find:  $c_{5.0} = 1.5 \times 0.28 = 0.42 \text{ mg/m}^3$ ;  $c_{5.1-10.0} = 1.5 \times (0.69 - 0.28) = 0.61 \text{ mg/m}^3$ ;  $c_{10.1-20.0} = 1.5 \times (0.94 - 0.69) = 0.38 \text{ mg/m}^3$ ;  $c_{20.1} = 1.5 \times (1 - 0.94) = 0.09 \text{ mg/m}^3$ .

Thus, by using rapid calculation of the dispersion of mining dust and the results of two-step measurements, we



Nomogram for rapid calculation of dispersion composition of mining aerosol using results of two-step gravimetric measurement of concentration ( $\alpha = c_1/c_0$ ).

can calculate the gravimetric concentrations of the particles of various fractions in the air. Knowing the quantitative indices of the dispersion of particles and the mechanisms of their deposition in the respiratory tract makes it possible to determine the effect of the dust factor on its various sections.

The use of the two-step gravimetric measurements in dust monitoring practice is limited by the lack of large enough quantities of the necessary equipment. However, in recent years a number of Soviet instruments have been invented that meet modern standards and their production is planned. Thus, the Leningrad Institute of Aviation Instrument Engineering has invented:

APL-1, a mobile laboratory for monitoring aerosol pollution in the environment and work site air. It is designed for two-step gravimetric measurements of the concentrations and specific surface of aerosols in field and station conditions. The TsRIP-M (PRIMA) portable radionuclide dust meter with digital indication of measurement results and a set of changeable cyclones supports long-distance connection and transmission of information along telemetry channels. The use of changeable filters makes it possible to research the dispersion phase of the aerosol. The range of measurable concentrations is 0.01-50 mg/m<sup>3</sup> (with modification, possible 0.1-500 mg/m<sup>3</sup>). Mass: 3.5 kg;

APL-2, a mobile laboratory for monitoring aerosol pollution in the environment and work site. It is designed for continuous monitoring of the aerosol concentrations by means of electric induction and periodical checking of measurement results by means of a radionuclide technique in field and station conditions. It makes it possible to take

samples on the microbiological insemination and gaseous pollution of the air when using the respective absorbers. It has an electric induction dust meter EIP-16K, automatic sampler APP-1, power supply unit, set of filters, small Krotov apparatus, and thermostat for culturing microbiological samples. The range of concentrations measured is 0.1-25 mg/m<sup>3</sup>. The volume of samples with an air flow rate of 20 l/minute 100, 200, and 400 liters. Mass: 4 kg;

Automatic small sampler (aspirator) with a capacity of 100 l/min, volume sample of 400-2,000 l. Mass: 2.5 kg.

The supplier of these instruments is TPO "Puls" (190031, Leningrad, ul. Przhevalskogo, d. 18, korp. B) and experimental studios of LIAP [as published] (190000, Leningrad, Center, ul. Gertsena, 67).

A mobile radioimmune rapid-acting two-step gravimetric dust meter IKAR-2 (RKP-7) with digital readout of measurement results was invented at the Institute of Complex Utilization of Mineral Resources in cooperation with the Central Institute for Pneumoconiosis Prophylaxis, USSR Ministry of Metallurgy. The range of measurements is 0.5-500 mg/m<sup>3</sup>. Automatic supply. Mass with the power supply unit: 3.5 kg. Supplier: "Pribor" Cooperative (700024, Tashkent, ul. Uygura, 314).

#### Conclusions

1. The further improvement of methods for measuring the dust factor and its physical and chemical characteristics and hygienic standardization with calculation of the mass and fractional composition of the dust is important to research on the prevention of dust diseases of the respiratory organs.

2. A two-step gravimetric method for measuring the airborne dust concentration simultaneously provides information on its dispersion composition. The separation of the fractions with the subsequent determination of the free silicon dioxide in airborne dust and its small fraction provide valuable additional information for assessing the effectiveness of sanitary and technical resources for controlling the dust and comparing measurement results with hygienic standards for aerosols that are primarily fibrogenic.
3. The distribution of dust particles in large and small fractions of mining dust by their sizes adheres to a logarithmically normal law. The gravimetric concentration of any size of particle in the composition of the dispersion phase can be calculated based on the two-step gravimetric measurements for dust content.
4. The Soviet two-step gravimetric dust meters make it possible to measure the concentrations of all airborne dust and its small fractions at the work site. The production of these instruments has begun on a cooperative basis. The planned serial large-scale production of instruments at government instrument engineering factories is needed.

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**Effect of Microwave Irradiation on Peroxide Modification of LDL of Human Blood Serum**

917C0361L Moscow RADIOPHYSICS in Russian  
Vol 30 No 5, Sep-Oct 90 (manuscript received 6 Feb 89)  
pp 675-678

[Article by V. M. Pleskov, N. B. Suvorov, and N. N. Vasilevskiy, Baltic Central Basin Hospital imeni Chudnovskiy, RSFSR Ministry of Health, Leningrad; Scientific Research Institute of Experimental Medicine, USSR Academy of Medical Sciences, Leningrad]

UDC 577.391.612.015.32

[Abstract] Raising the level of lipid peroxidation in the body makes it possible to modify low-density lipoprotein (LDL), which in turn can lead to the development of atherosclerosis. High-density lipoprotein (HDL) has the capacity to obstruct the modification of LDL and to slow lipid peroxidation. The work reported here studied the effect of UHF fields on lipid peroxidation in LDL, plus the role played by HDL in preventing that effect. In vitro study of donor blood involved irradiation of blood samples at  $\lambda = 2375$  mHz. The irradiation resulted in an increase in malonic dialdehyde levels and in solution turbidity, thereby indicating elevated lipid peroxidation in LDL and the formation of aggregates of those particles. When the total HDL fraction was added to the solution, malonic dialdehyde levels declined, as did aggregate formation. HDL subfractions produced opposing effects. Figures 3; references 25: 12 Russian, 13 Western.

**Protection of Mice From X-Radiation With Sodium Succinate**

917C0361M Moscow RADIOPHYSICS in Russian  
Vol 30 No 5, Sep-Oct 90 (manuscript received 3 Jul 89)  
pp 704-706

[Article by Yu. Yu. Ivintskiy, R. Shturm, Military Medical Academy imeni S. M. Kirov, Leningrad]

UDC 577.391.599.323.4

[Abstract] A report that survival rate was increased by 50 percent in irradiated mice administered sodium succinate 30 minutes before exposure prompted the researchers here to study the dose dependence and time dependence of the radioprotective effect of sodium succinate. Albino mice were exposed to doses of x-radiation ranging from minimal to absolutely lethal at 0.662 Gy/min. It was found that sodium succinate, in a dose of 10 mmole/kg, has a moderate radioprotective effect on mice, whose survival may be extended by administration of the preparation 24 hours before irradiation. The experimental data indicate that the radioprotective effects is linked to attenuation of the radiation injury to the hemopoietic system. All doses produced a diminution of spleen mass and DNA content in bone marrow. The results of the experiment confirm earlier data on the radioprotective effect of sodium succinate, but ascribe the phenomenon to the preparation's effect on the dynamics of cell populations of the hemopoietic system. The radiation dose ranges that were examined

corresponded to those producing radiation sickness. The researchers established that one of the conditions potentiating the observed effect is repeat administration of the preparation. Figures 2; references 10: 7 Russian, 3 Western.

**Cytotoxic Activity of Natural Killers When  $^{239}\text{Pu}$ , Hexachlorobutadiene, and Tributylphosphate are Administered Separately or in Combination**

917C0361N Moscow RADIOPHYSICS in Russian  
Vol 30 No 5, Sep-Oct 90 (manuscript received 24 Oct 89) pp 709-711

[Article by Ye. N. Kirillova, V. A. Chudin, and M. A. Okatenko, Institute of Biophysics, USSR Ministry of Health, Moscow]

UDC 577.391.612.01.017.1

[Abstract] The literature contains virtually no data on the status of cellular immunity when the body is exposed to  $^{239}\text{Pu}$  and chemical substances. In light of the role of natural killers in antineoplastic immunity, the researchers here performed a qualitative assessment of the magnitude of damage and the completeness of restoration of function of those cells during the period characterized by the long-term effects of radiation and chemical injury. The cytotoxic activity of natural killers in the spleen of Wistar rats was studied after  $^{239}\text{Pu}$ , hexachlorobutadiene, and tributylphosphate were administered in combination or separately. The researchers found that the inhalation of  $^{239}\text{Pu}$  resulted in reduced function of natural killers in the first two months only. Upon inhalation of the chemicals separately, function was lower and changes were phased. A nearly addictive effect was observed when the chemicals were inhaled together. When all three substances were inhaled, the damaging effect was amplified 1.5-fold above any taken separately. Natural killer activity was restored within 120-240 days. References 6: 4 Russian, 2 Western.

**Peak Pressures and Temperatures in UV Laser Ablation of the Cornea**

917C0467A Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA FIZICHESKAYA in Russian Vol 54 No 8, Aug 90 pp 1581-1585

[Article by Ye. N. Beylin, A. K. Dmitriev, Ye. N. Lekhtsiyer, M. Yu. Orlov, A. D. Semenov, V. S. Tyurin, and N. P. Furzikov, Scientific Research Center for Production Lasers, Interbranch Scientific and Technical Complex "Mikrokhirurgiya glaza"]

UDC 615.47:621.373.826

[Abstract] Owing to the fact that nonstationary values for temperature and pressure in tissues involved in laser ablation are not precisely determined by techniques such as thermal imaging, the researchers here used a technique they had developed on the basis of time-of-flight measurement of supersonic dissociation velocities of ablation products in the context of the theory of shock waves. Since soft tissue consists principally of water, and the cornea

tissue structure impedes the water's convection during the ablation procedure, the technique is well suited for measurements during laser ablation. In ablation of corneas of enucleated pig eyes, the researchers used an ArF laser operating at a wavelength of 193 nm, with a pulse duration of 20 ns. They found that at approximately 1 mm from the cornea, the shock wave moved at a virtually constant velocity equal to the initial velocity, which fluctuated between 1.1 km/s<sup>-1</sup> and 1.5 km/s<sup>-1</sup>, depending on the energy density. The initial vapor pressures and the temperatures attending them were determined from the initial shock wave velocities. The researchers found a linear growth in pressure and temperature at energy densities above threshold, which indicated that the ablation mechanism is not confined merely to explosive boiling of water—the boiling converts the water into a compressed, hot, vapor-droplet mixture that slowly expands into the surrounding air. Figures 4; references 23: 10 Russian, 13 Western.

### Keratormodeling With Low-Intensity UV Emissions of Excimer Lasers

917C0467B Moscow *IZVESTIYA AKADEMII NAUK SSSR. SERIYA FIZICHESKAYA* in Russian Vol 54 No 8, Aug 90 pp 1594-1596

[Article by I. M. Kornilovskiy, A. M. Razhev, S. S. Kutay, and V. A. Semchishen, Moscow Scientific Research Institute of Eye Diseases imeni Gelmgolts; Institute of Thermal Physics, Siberian Branch, USSR Academy of Sciences; Scientific Research Center for Production Lasers, USSR Academy of Sciences]

UDC 621.373.826+615.47.471

[Abstract] Fifty model samples of various polymer materials and the corneal tissue of 46 eyes served as the experimental material on which the researchers studied the possibilities of keratormodeling of low-intensity, pulsed UV radiation from ArF, KrCl, KrFF, and XeCl excimer lasers with a subablation energy density. The research demonstrated that the range of threshold energy density not resulting in ablation expands with increasing wavelength and narrows with increasing pulse train frequency. The range differed for the corneal tissue, because it is a complex, high-molecular biopolymer with a high water content. The researchers found it possible to target the mechanical properties they chose to weaken; optical characteristics varied with radiation wavelength. Varying the wavelength changed the corneal profile and refraction as a function of laser application topography, with the corneal refraction change ranging from 0.5 diopter to 11.0 diopters. The researchers suggest that low-intensity UV emissions from excimer lasers can be used to alter the shape (curvature) of the cornea without coagulation or vaporization of its tissue. References 9: 4 Russian, 5 Western

### Elevation of Radiation Resistance of Retina in Laser Coagulation

917C0467C Moscow *IZVESTIYA AKADEMII NAUK SSSR. SERIYA FIZICHESKAYA* in Russian Vol 54 No 8, Aug 90 pp 1603-1606

[Article by G. I. Zheltov, V. N. Glazkov, A. S. Podoltsev, L. A. Linnik, and A. P. Privalov, Institute of Physics imeni B. I. Stepanov, BSSR Academy of Sciences]

UDC 621.378.325:612.84

[Abstract] Elevation of retinal radiation resistance as a response to exposure to high-intensity visible light was discovered in the course of studies of the mechanisms of the coagulating effect that laser emissions have on biological tissue. Experiments on laboratory animals measured the relationship between the ED<sub>50</sub> threshold of radiation energy and radiation parameters such as wavelength, pulse duration, and diameter of irradiated area. Levels of maximum heating of the biostructures of the eye fundus, or threshold temperatures, were extrapolated from the experiment's results. Additional experiments compared the ED<sub>50</sub> values for continuous argon emissions ( $\lambda = 514$  nm) and for the second harmonic emissions of a garnet laser ( $\lambda = 530$  nm) in the form of a regular train of pulses. The researchers suggest that the role of nonlinear photochemical processes is negligible in the elevation of retinal resistance and that radiation intensity should not be viewed as a primary factor determining the nature of the threshold temperature dependence for either the visible or IR range. The elevation of the threshold temperature when pulse duration is increased within a given range suggests that intense visible light can alter the biochemical balance in the retinal cells so as to effect adaptation to the irradiation conditions. After experiments involving a YAG laser ( $\lambda = 1064$  nm) trained on a rabbit retina and switched on immediately after an argon laser was switched off, the researchers found that retinal radiation resistance increased 2.5- to 3-fold. When the energy level of the argon laser was reduced, elevation of retinal resistance dropped. The researchers also found that, in an experiment on monkeys, the time it took for restoration of the initial biochemical state of the retina after exposure to a pulse lamp was about two minutes. In addition to the winking reflex and narrowing of the pupils, there is apparently a photostimulated biochemical process that elevates the retina's resistance to radiation within about 0.1 second. Figures 4; references 7: 5 Russian, 2 Western.

### Possibilities of Joint Action of Emissions From YAG:Nd and YAG:Er Lasers on Tissues of Experimental Animals

917C0467D Moscow *IZVESTIYA AKADEMII NAUK SSSR. SERIYA FIZICHESKAYA* in Russian Vol 54 No 8, Aug 90 pp 1607-1610

[Article by L. M. Roshal, N. Ye. Gorbatova, Yu. L. Livshits, Yu. G. Parkhomenko, V. V. Osiko, Yu. K. Danileiko, A. V. Sidorenko, T. V. Tulaykova, and A. D. Ivanov]

UDC 615.845.19.03:617.015.4:579.842.11].076.7

[Abstract] Although the positive aspects of continuous CO<sub>2</sub> lasers and YAG-Nd lasers are unquestioned, certain features of their interaction with biological tissue—thermal burn, for example—limit their use in clinical practice. In the wake of research demonstrating lasers operating in pulsed-periodic mode enable the achievement of relatively high energies while reducing exposure time,

the researchers here studied the properties of pulsed YAG-Nd and YAG-Er lasers, the latter having an anomalously high absorption in tissue. They also examined the results of their combined action on Wistar rat tissues. The YAG-Nd laser was found to produce a marked coagulating-hemostatic effect on parenchymatous organs, whereas the YAG-Er laser proved to be effective in tissue dissection. Simultaneously focusing both lasers on the same point produced an effect that combined the strengths of both lasers. References 16: 7 Russian, 9 Western.

**Effect of Low-Intensity Pulsed Scattered Laser Radiation on Functional Status of Visual Analyzer**  
917C0543B Moscow GIGIYENA I SANITARIYA  
in Russian No 2, Feb 91 (manuscript received  
17 Apr 90) pp 23-25

[Article by A. B. Butman and A. N. Lotarev, Military Medicine Academy imeni S. M. Kirov, Leningrad]

UDC 617.7-057-02:[613.648.2:615.849.19]-07

[Text] In recent years laser radiation has been gaining in use in various fields of science, technology, and medicine. The number of studies related to the visual observation of laser radiation is rising. An example of this is the means for depicting information based on scanning semiconductor lasers [5]. When operating such devices, an individual is exposed to the chronic effect of scattered pulse-modulated laser radiation. In this respect, matters of the maximum acceptable level of coherent monochromatic radiation become very important.

Modern hygienic approaches to standardization of laser radiation take into account the bioeffects and the general unspecific alterations to some organs and systems of the body in response to laser radiation. At the same time, the pathogenetic mechanisms of these changes remain inadequately investigated, judging by published data [2]. We believe that at a given dynamic interval of laser radiation intensities, the changes in the body, including those of the visual analyzer, are adequate physiological reactions to light stimulation [2]. However, there are no published data on the qualitative evaluation of the bioeffects that support this position with respect to the visual analyzer.

This problem is very important in order to understand the mechanism of the above listed general reactions of the entire body to the effect of laser radiation, which, according to a number of researchers [1, 3], stimulates and restimulates the hypothalamus centers and reticular formation that regulates the sympathetic nervous system activity upon stimulation of the retina photoreceptor.

In order to make standardization of laser radiation in the so-called secondary effects more accurate, the reaction of the visual analyzer to a laser stimulant needs to be evaluated.

This study is devoted to establishing the relationship between the level of disadaptation of the visual analyzer

and the energy density of a low-intensity scattered pulsed-modulated laser radiation in the visible spectrum on the rabbit eye.

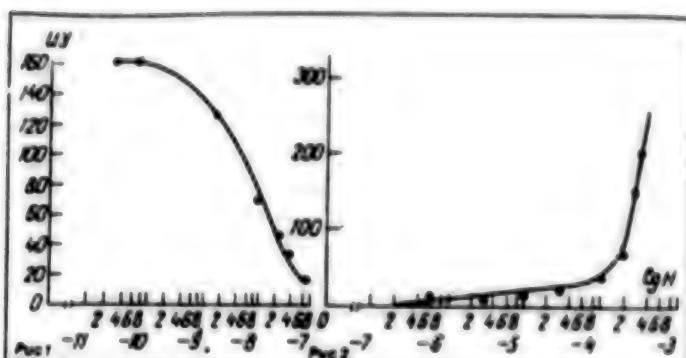
**Method:** The source of the radiation was a solid-body laser with a 0.53 μm wavelength and pulse duration of 10 nsec. The experiments used a single pulse (monopulse) and pulses with a frequency of 50 Hz. The retina of the rabbit eye was stimulated with scattered radiation emitted by a light screen on which a straight beam fell. The angle size of the radiation source in the experiments was 1 rad. The energy density of the radiation pulse on the cornea of the animal was measured with a ILD-2M device. The low energy exposure to radiation was created by attenuating the energy of the straight beam radiation with calibrated neutral NS [as published] light filters. The functional status of the retina was evaluated by means of electroretinography, which included an analysis of the b-wave amplitude of the electroretinogram (ERG).

This method is suitable for investigating processes in the nerve elements of the retina and is used in particular for evaluating the disadaptation effect of light stimuli [4]. The baseline level of the b-wave ERG amplitude with a standard test photostimulation of 2 Hz pulse frequency and energy signal 20 decibels above the threshold for this index were measured in the animals under conditions of thermal adaptation (less than 0.1 lux background illumination). The illumination on the rabbit cornea created by the test polychromatic light was 5 lux. The maximum duration of a single stimulation was no more than two minutes. In this regimen of photostimulation, the test signal did not have an independent disadapting effect on the functional status of the retina, and the amplitude of the baseline b-wave ERG, observed for 120 minutes, remained relatively constant.

At the second stage of the research, the b-wave ERG amplitude was measured under these conditions, but against measured exposure of the retina to scattered laser radiation at a pulse frequency of 50 Hz for 10 minutes or after a monopulse. In order to evaluate the disadaptation of the visual analyzer the b-wave ERG amplitude was also investigated immediately after exposure ceased.

The research was conducted in a monocular manner. In order to eliminate any possible effect of the pupil on the bioelectrical response of the retina, a 1 percent atropine solution was placed in the rabbit eye. The "electroretinograph" signal, which was amplified with the "Bioskript" instrument, was recorded on a TEAC magnetograph. We calculated the average amplitude of the b-wave ERG at a confidence interval corresponding to an average probability of 95 percent or greater. The interval was generally no more than + μV.

**Results:** There was almost no decrease in the b-wave ERG amplitude when the retina was stimulated with scattered laser radiation at a frequency of 50 Hz and energy density of a single pulse of  $10^{-11} \text{ J} \times \text{cm}^{-2}$  to the cornea (Fig. 1). Exposing the retina to radiation of the order of  $1 \times 10^{-9} - 1 \times 10^{-7} \text{ J} \times \text{cm}^{-2}$  had a noticeable disadapting effect. However, this disadaptation should apparently be viewed as an



**Figure 1. Amplitude of b-wave ERG as function of energy density of scattered pulse-modulated laser radiation with a wavelength of 0.53 μm and pulse frequency of 50 Hz on the cornea.**

x-axis: logarithm of energy density of radiation from single pulse,  $J \times \text{cm}^{-2}$ ; y-axis: b-wave ERG amplitude against laser radiation stimulation of retina,  $\mu\text{V}$ . Key: 1. baseline level.

**Figure 2. Time for restoration of b-wave ERG amplitude of rabbit eye to baseline level as function of energy density of scattered single laser pulse 0.53 μm long.**

x-axis: energy density of radiation (logarithmic scale),  $J \times \text{cm}^{-2}$ ; y-axis: time for b-wave ERG amplitude to return to normal, seconds.

adequate physiological reaction of the eye to a light stimulus. This is indicated, in particular, by the fact that after the stimulant ceases, the b-wave ERG amplitude returns to the baseline level within 1-2 seconds. It should also be noted that even with the maximum of the indicated energy densities, the levels of b-wave amplitude reduction at minutes 1 and 10 of laser stimulation did not reliably differ, and the stimulant during this time did not have a cumulative effect. With greater energy densities ( $1 \times 10^{-6}$  -  $4 \times 10^{-4} J \times \text{cm}^{-2}$ ), the b-wave ERG amplitude decreased immediately after exposure of the retina to a single pulse (monopulse) of scattered laser radiation. The data demonstrate (Fig. 2) that the effects of suppressing the b-wave ERG amplitude are sharply enhanced with energy densities greater than  $1 \times 10^{-4} J \times \text{cm}^{-2}$ . For example, after exposing the eye to a single pulse of laser radiation with an energy density of  $3.5 \times 10^{-4} J \times \text{cm}^{-2}$ , it took approximately 200 seconds for the b-wave ERG amplitude to return to baseline level (see Fig. 2), which suggests that suppression of the functional status of the retina is rather extensive.

Thus, the reaction of the visual analyzer may be divided into three levels, depending on the energy of the scattered pulse-modulated radiation acting on the retina. With a radiation energy density of  $10^{-11} J \times \text{cm}^{-2}$  or less, stimulation of the retina with a laser stimulant did not have any noticeable effect on its bioelectrical activity (first level); the second level of reaction of the visual analyzer is characterized by suppression of the b-wave ERG amplitude only during the laser stimulation of the retina, and is viewed as an adequate physiological reaction of the eye to a light stimulus. This level corresponded to an energy density of a single pulse of radiation in the interval  $1 \times 10^{-6}$  -  $1 \times 10^{-7} J \times \text{cm}^{-2}$ . With greater energy exposures to radiation of the order of  $6^{-4} \times 10^{-4} J \times \text{cm}^{-2}$ , the disadapting effect of the laser stimulus in the form of a temporary decrease in the b-wave ERG amplitude is expressed after

stimulation of the retina with a monopulse. Moreover, suppression of the bioelectrical activity of the retina rose substantially with radiation energy densities greater than  $1 \times 10^{-4} J \times \text{cm}^{-2}$ . We attributed this disadaptation to the third level of visual analyzer reaction to low-intensity pulse-modulated scattered laser radiation in the visible band of the spectrum.

#### Conclusions.

1. A relationship between the level of disadaptation of the visual analyzer and the energy density of scattered low-intensity pulse-modulated radiation with a wavelength of 0.53 μm was found.
2. The functional mechanisms of the disadaptation effect of laser radiations on the bioelectrical activity of the retina should ideally be used to better define the pathogenetic mechanisms of general reactions of the entire body to the effect of laser stimulation.

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**Intravascular Laser Irradiation of Blood in Treatment of Purulent Septic Disease**

917C0568A Tashkent MEDITSINSKIY ZHURNAL UZBEKISTANA in Russian No 11, Nov 90 (manuscript received 13 Mar 89) pp 21-22

[Article by B. R. Babadzhanyan, B. R. Khusanov, Sh. N. Khodzhayev, and A. R. Eshchanov, Khorezmkiy oblast Hospital No 1.]

UDC 616.94-085.849.5

[Abstract] The use of intravascular laser irradiation was studied in 129 patients ages 18 to 76 with purulent septic disease. The patients were treated daily for one hour with the laser, in addition to surgery, antibiotics, detoxification and immunotherapy. Rapid normalization of body temperature, restoration of appetite and peristalsis, reduction of pain, and stabilization of blood pressure, heart rate and respiration were noted, as well as neuroleptic and analgesic effects. The leukocyte level normalized, while the lymphocyte level increased. Levels of T-lymphocytes increased, while those of B-lymphocytes decreased by a factor of 1.5

The results obtained indicate that laser irradiation is useful in the treatment of purulent septic disease.

**Effect of Hemosorption on Levels of Histamine, Serotonin, and Moderate Molecular Weight Toxins in Experimental Peritonitis**

917C0568B Tashkent MEDITSINSKIY ZHURNAL UZBEKISTANA in Russian No 11, Nov 90 (manuscript received 13 Jan 89) pp 53-55

[Article by A. R. Gutnikova, R. I. Ashurmetov, M. M. Alimov, and N. M. Gerasimov, Tashkent Department, VNTsKh [not otherwise identified], USSR Academy of Medical Sciences]

[Abstract] The effect of activated charcoal hemosorption on the content of various toxins in the peripheral circulation was investigated in ten dogs with experimental peritonitis. The dogs were treated with dimethylmeperidine, diphenhydramine, atropine, and hexanal, followed by introduction of about 3 million microbes per kg into the peritoneal cavity. Hemosorption decreased serotonin levels by 55 percent, and the levels of other moderate molecular weight toxins by 45 percent. Serotonin levels increased if the procedure was repeated probably due to degranulation of fat cells. Histamine levels were uniformly low, and only increased at the last stage of treatment. This is likely to be a result of lowered activity of histidine decarboxylase. The results obtained indicate that hemosorption can improve patient status in the treatment of peritonitis. References 5; Russian

**Phonophoresis of Proteolytic Enzymes Lekozim and Kollalizin in Comprehensive Therapy of Eye Burns**

917C0470A Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, Dec 90 (manuscript received 10 May 90) pp 321-324

[Article by S. A. Yakimenko and R. I. Chalanova, Odessa Order of the Labor Red Banner Scientific Research Institute of Ocular Diseases and Tissue Therapy imeni Academician V. P. Filatov]

UDC 617.713-001.37:615.837.3

[Abstract] Enzymatic necrotomy by means of phonophoresis with the proteolytic enzymes lekozim [sic] and kollalizin [sic] was investigated as a technique for removing necrotic sections of the conjunctiva following burns to the eyes. Twenty-six patients (29 eyes) were treated with three to five phonophoresis sessions beginning two days after injury, in addition to conventional therapy. The results demonstrated that vascularization was restored in the experimental group within an average of 13.5 days, while it took 25.4 days for the control group. It was also shown that experimental patients noted less pain and better visual acuity within the first few treatments. Analysis of the findings indicated that treatment effectiveness depended on the degree of opacification of the cornea. Phonophoresis can be used during the acute stage of the eye burn or upon completion of epithelialization. In conclusion, this treatment helps heal the anterior chamber of the eye more quickly, improves the blood supply in the conjunctiva, accelerates corneal vascularization and epithelialization, and decreases scarring. The primary advantages of enzymatic necrotomy include the fact that this process removes only the necrotic tissue and that it gradually cleanses the burn tissue while leaving the elements vital to regeneration intact. Tables 2; references 10: 9 Russian, 1 Western.

**Sorption Detoxication in Comprehensive Therapy of Chemical Ocular Burns**

917C0470B Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, Dec 90 (manuscript received 3 Apr 90) pp 324-327

[Article by Yu. F. Khatminskiy, Ye. S. Beloborodova, M. P. Pronin, and O. M. Lukinykh, Kemerov Medical Institute, Kemerov Interoblast Center for Ocular Microsurgery]

UDC 617.713-001.37-085

[Abstract] Between 1988 and 1990, clinical trials were conducted on 90 patients (103 eyes) with fresh chemical burns of an average degree of severity investigate the potential for using sorption methods of therapy in the conventional therapy of eye burns. Sorption therapy includes the use of polymer, synthetic, and biological materials that absorb acidic and alkaline solutions very well. The subjects were given ocular therapeutic ion-exchanging inserts specific for acid or base ions. Comparison of results from this group with the control group,

which received conventional treatment, demonstrated that the experimental therapy was very effective. Furthermore, combining the experimental and conventional treatments yielded even better results. It was also shown that success depended on the promptness of care. In addition, this treatment decreased the hospital stay from 16.2 days for the control group to 9.5 for the experimental cohort. In conclusion, the results of this study were quite positive and suggest that the experimental treatment with sorption methods of therapy should be included in the conventional treatment of chemical burns to the eye. Tables 3; references 7: Russian.

**Corneal Burn Treatment With Ocular Films Containing Apilak**

917C0470C Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, Dec 90 (manuscript received 14 Mar 90) p 334

[Article by G. L. Prokofyev, V. P. Mozherenkov, and P. V. Khegay, MONIKI [as published] imeni M. F. Vladimirsckiy]

UDC 617.713-001.37:615.015.154

[Abstract] Previous experimental and clinical studies have demonstrated that apilak [sic] (bee's mother's milk) can be used to stimulate metabolism in the injured cornea and accelerate its epithelialization. Clinical trials were performed on 47 patients aged 6-60 years with thermal and chemical (acid and base) burns of the cornea. Both the experimental and control groups received conventional therapy. In addition to this, the patients in the experimental cohort had a therapeutic ocular film with apilak placed behind the lower eyelid one to three times per day for four to seven days. Twelve patients also were subjected to daily irradiation of the cornea with a low-intensity helium-neon laser. The results demonstrated that this treatment was effective in 78.7 percent of the patients. Within four to six days, complete epithelialization was achieved, and there was a marked increase in visual acuity. The average hospital stay also decreased by four days. The findings suggest that this treatment may be used in managing eye burns. References 6: Russian.

**Experimental Substantiation of Use of RNA Hydrolysate ENKAD in Chemical Burns to Cornea**

917C0470D Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, Dec 90 (manuscript received 10 May 90) pp 338-343

[Article by O. A. Andrushkova, V. P. Plevinskis, and S. A. Yakimenko, Odessa Labor Red Banner Scientific Research Institute of Ocular Diseases and Tissue Therapy imeni Academician V. P. Filatov]

UDC 617.713-001.37-085:612.085.1

[Abstract] The content of a number of cytochemical components of the cornea (total protein, amino acids, cysteine, cystine, arginine, glutamic acid, and RNA) in burn process

dynamics was investigated on 158 chinchilla rabbits afflicted with chemical burns to the eyes caused by caustic sodium. Preliminary data showed that the cystine:arginine ratio was 0.1:0.2 and that the glutamic acid:cysteine ratio was 0.35:0.35. The results demonstrated that subsequent to the burn there are shifts in the amino acid composition and a decrease in the RNA level, as indicated by conformational alterations of the proteins. The efficacy of a number of therapeutic measures designed to correct the disturbances (ultrasound, applications, subconjunctival injections, and ENKAD [as published] phonophoresis) was assessed. The best results were achieved with ENKAD phonophoresis that began five days after the burn. Corneal epithelialization was completed by 9.3 days. RNA and protein levels had decreased by 14 days, and there were fewer complications (8.3 percent). It was determined that one of the factors of the therapeutic effect of ENKAD phonophoresis was that it normalized the amino acid ratio in the proteins. Figures 4; tables 2; references 13; Russian

#### Novel Pyrimidine Derivative Preparation for Treatment of Experimental Chemical Burns to Eyes

917C0470E Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, Dec 90 (manuscript received 22 Feb 90) pp 344-347

[Article by N. B. Leonidov, M. A. Kolesnikova, N. G. Seleznev, B. F. Cherkunov, and T. V. Tarapina, Provisional Interbranch Scientific Collective "Bioeffect." State Committee for Science and Technology; USSR Academy of Sciences, Moscow; Ryazan Medical Institute imeni Academician I. P. Pavlov]

UDC 617.713-001.37-085:612.085.1

[Abstract] Experimental trials were performed on 87 chinchilla rabbits with alkali-induced burns caused by placing three drops of a 5 percent solution of NaOH in the conjunctival sac, in order to assess the effectiveness of LYuS-3 pyrimidine derivatives in ointment form on chemical burns. The animals were separated into four groups: 1—control; 2—2 percent solution of methyl uracil in ointment form, six times per day; 3—30 percent sodium sulfacyl, six instillations and three ointment applications per day; and 4—LYuS-3 in ointment form, six times per day. The data demonstrated that LYuS-3 helps prevent secondary infections and complications much better than the other ointments. It rapidly resolves transudates and infiltrates and quickly rejects necrotic sections. The results suggest that LYuS-3 has marked regenerative properties that contribute to more rapid epithelialization of the cornea. Tables 1; references 9; Russian.

#### Effect of Thymogen on Mitosis in Corneal Epithelium Under Normal Conditions and Under Conditions of Experimental Thermal Burn

917C0470F Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, Dec 90 (manuscript received 20 Feb 90) pp 348-351

[Article by T. S. Kozmova, Chair of Ocular Diseases, Khabarovsk Order of the Labor Red Banner Medical Institute]

UDC 617.713-001.17-085:612.085.1

[Abstract] Experimental trials were performed on 140 albino rats with third degree burns to the eyes in order to assess the effect of thymogen on mitosis in the cornea. Results of radioautographic analysis demonstrated that thymogen injections (10 µg/kg per day for 28 days, intramuscularly) accelerate mitosis in the rat corneal epithelium from three to 14 days after the burn. It also decreases inflammation and the incidence of perforation. Accordingly, thymogen treatment of burns to the eyes appears promising. Tables 1; references 13; Russian

#### Clinicomorphological Basis for Pathogenetic Management of Industrial Burns to Eyes

917C0470G Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, Dec 90 (manuscript received 24 Apr 90) pp 358-361

[Article by I. P. Khoroshilova, L. V. Ilatovskaya, G. G. Bordyugova, and F. S. Gakhramanov, Moscow Scientific Research Institute of Ocular Diseases imeni Gel'mgolets]

UDC 617.7-001.37-085

[Abstract] Experimental trials were performed on 10 chinchilla rabbits (60 eyes) in order to investigate the aspects of and find treatments for eye burns caused by an 85 percent solution of epichlorohydrin. All of the animals were given two drops of a 30 percent solution of sodium sulfacyl five times per day in the conjunctival sac throughout the observation period. In addition, rabbits in the experimental cohorts were administered either instillation of gordox (two drops five times per day) into the conjunctival cavity or 0.5 ml of gordox intravenously per day for 10 days. The results indicate that epichlorohydrin burns are serious. Epichlorohydrin affects the iris and the cornea with vascular plethora and widespread hemorrhaging. Gordox decreases cellular infiltration into the cornea especially in those animals given the intravenous injections of gordox, since it inhibits protease activity and the migration of cellular elements to the site of the injury. The data also suggest that gordox should be used only for the first seven days following the injury, as continued use may suppress reparation and cause dystrophic alterations. However, gordox does not affect the pathological processes caused by epichlorohydrin that occur in the iris, and thus other means for treating epichlorohydrin burns need to be sought. Figures 6

#### Arc Wedge Keratoplasty to Correct Astigmatism

917C0470H Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 6, Dec 90 (manuscript received 2 Nov 89) pp 372-374

[Article by N. M. Sergienko and N. S. Lavrik, Chair of Ocular Diseases, Kiev State Institute for the Advanced Training of Physicians]

UDC 617.753.3-089.843

[Abstract] This paper presents information on a technique that has been developed for correcting astigmatism in the

3.0-4.0 D range. Arc wedge keratoplasty was employed in the treatment of 19 eyes with compound myopia and mixed astigmatism (13 eyes) which could not be corrected with contact lenses or glasses. Two arc-shaped non-perforating incisions were made to a depth of 80 percent of the cornea. The donor cornea was then inserted between the incisions. The results demonstrated that arc wedge keratoplasty acts on both meridians to successfully correct the mixed form of astigmatism from an average of 6.8 D to 2.2 D. Arc wedge keratoplasty is less traumatic than trapezoidal or corridor keratotomy, since it involves only two incisions. The contraindication to this operation in an unstable clinical condition of eyes subjected to cavitary surgery. Figures 2; tables 2; references 16: 10 Russian, 6 Western.

### Some Statistics on Population Morbidity

917C05134 Moscow SOVETSKOYE  
ZDRAVOKHRANENIYE in Russian No 2, Feb 91  
(signed to press 18 Jan 91) pp 37-40

[Article by T. M. Maksimova, Ye. I. Krtskiy, O. B. Karpova, E. Z. Isakov, and A. V. Golovnya, All-Union Scientific Research Institute imeni N. A. Semashko]

UDC 312.6+614.1:312.6

[Text] There are various statistical indicators that reflect the objective characteristics of a population as related to morbidity.

Overall morbidity indicators,<sup>1</sup> differentiated according to its main structural elements (classes of disease, major nosological forms and groups of diseases) and factors determining formation of pathology—age and sex, are used in Soviet sociohygienic investigations, since they offer the fullest characterization of morbidity.

In view of the different etiopathogenetic mechanisms in formation of various nosological forms of pathology, statistical description of a complex sociobiological morbidity phenomenon is traditionally provided for the largest statistical groups constituting 17 classes of diseases according to the MKB [International Classification of Diseases]. This is largely warranted, since such a contingency enables us to come closer to statistical comparability of results of investigations carried out by different authors in different territories, as well as to assess the dynamics of a phenomenon when comparing data pertaining to different periods of time.

On the other hand, the content of the main groups (classes) of diseases covers the entire complexity of nosological forms contained in each class, and each form has its own complex features of formation and individual correlation to the factors under study. Thus, deeper investigation within a class of diseases or independently of such grouping reveals nosological forms and groups of diseases. In this case, one can also use both the rather unified lists recommended by WHO (see MKB-8, MKB-9), and the lists of diseases elaborated independently by investigations, which usually indicate which MKB entries were used.

At the same time, it is already apparent that isolated disease is encountered rather seldom; conversely, numerous diseases and systemic lesions in the same patients are a reality. All this raises the question of criteria for keeping records of pathological states, making selections for coding, as well as using them for quantitative estimates of incidence rates. Finally, the applied aspect of basic research on incidence rates is also rather important, i.e., in the direction of using the obtained statistics to make decisions as to strategy and tactics of medical care of the public in different health care services.

This spectrum of problems compels us to assess the statistical characteristics of morbidity in accordance with specific problems, bearing in mind the feasibility of regrouping statistical data on recorded diagnoses with use of modern computers.

As an example, we can refer to investigation of morbidity in Kemerovo,<sup>2</sup> based on frequency of seeking medical care in preventive medical institutions (LPU) of the city.

In the course of this study, it was established<sup>4</sup> that LPU physicians used a rather wide spectrum of diagnoses that could be reduced through statistical processing to 498 three-digit MKB-9 entries, further breakdown provided differentiation of 940 four-digit subentries.

This material did not provide statistical characteristics of rather rare diseases (31.9 percent, i.e., one-third of all unused entries referred to classes of infectious and parasitic diseases, including pathology and neoplasms that are not encountered in the region studied).

The rest of the forms of pathology that were not diagnosed in health care practice refer to several groups. These are primarily diseases requiring rather complicated methods of identification that are not in use in mass-scale practice. They include subtle metabolic disturbances, impairment of amino acid transport and metabolism, mineral and fluid-base metabolism and acid-base equilibrium, immune mechanisms, and genetic disturbances.

Here it is particularly important to single out pneumonia caused by an identified pathogen, for which purpose the appropriate diagnostic laboratory capabilities are needed, as well as some lung diseases induced by exogenous factors.

Mixed lesions listed in MKB-9 have not been recorded, this refers in particular to diseases of the musculoskeletal system and connective tissue related to another disease classified under other headings, multiple and combined trauma, and with respect to symptoms—nonspecific deviations from normal detected upon examination, as well as groups of pathological deviations with iatrogenic causes, side effects and prescription drug abuse. However, unconfirmed [or undefined] diagnoses are used rather often. In general the data obtained on the basis of this sample characterize rather comprehensively adult urban morbidity and can be used for different purposes.

As already indicated, in accordance with existing traditions in Soviet statistics, data on morbidity are processed statistically for the main classes of diseases, earmarking the main nosological forms of pathology as related to age and

sex groups. Analysis of these data reveals the inherent distinctions of age-related overall morbidity, which are consistently demonstrable regardless of place, time and method of gathering morbidity information, and they can be viewed as a strictly objective established pattern. This pattern is described by a typical curve reflecting the process of change in adaptation of the population to environmental conditions with age-related changes in biological properties. Each of the pathological forms united in the concepts of "classes of diseases" and "overall morbidity" has its own specific age-related dynamics and sex-related distinctions.

There are also stable characteristics in the structure of overall morbidity when diagnoses are grouped according to classes of diseases; in particular, when ranking the

incidence of pathology according to recorded cases, virtually all studies report that diseases of respiratory organs constitute the largest share in the structure of morbidity. The deviations from these patterns, which are found upon investigation of some area or a concrete population group, or when assessing dynamic changes, indicate that factors with specific action are responsible for such changes.

The diagnoses recorded in the study of overall morbidity can also be grouped on a different basis. For example, one can form basic diagnostic categories,<sup>5</sup> which actually reflect the distinctive features of organic and systemic involvement regardless of etiology (pathogens of infection), exogenous factors, including mechanical (trauma) or other mechanisms of formation. The age-related distinctions of statistical characteristics of the main diagnostic categories are listed in Table 1.

**Table 1. Age-related distinctions of incidence of main diagnostic categories per 1000 population, Kemerovo, 1986**

Class of diseases	Age group						Total
	20-29	30-39	40-49	50-59	60-69	70 & older	
Diseases and disorders of:							
Nervous system	17.9	21.8	50.7	95.4	193.5	229.6	650
Eye	48.3	62.3	109.6	133.1	250.7	210.7	103.9
Ear, nose, mouth and throat	337.2	304.5	287.2	216.3	228.3	228.3	285.1
Respiratory system	46.6	77.9	97.2	149.2	171.7	157.2	98.0
Circulatory system	41.2	78.7	148.9	241.9	564.0	600.0	181.2
Digestive system organs	76.2	89.5	135.5	168.0	149.9	116.4	114.3
Hepatobiliary system and pancreas	26.0	31.9	75.5	68.5	100.8	75.5	53.2
Musculoskeletal system and connective tissue	53.8	134.0	264.7	270.2	280.7	223.2	180.0
Skin, subcutaneous tissue and breast	109.4	98.1	94.1	100.8	114.4	106.9	102.2
Endocrine, related to diet and metabolic disturbances	30.5	18.7	43.4	44.4	103.5	69.2	40.2
Kidneys and urinary tract	43.9	33.5	61.1	92.7	103.2	47.2	56.9
Male reproductive system	18.8	3.4	11.1	9.3	44.6	63.2	14.3
Female reproductive system	179.0	178.0	127.4	153.7	66.7	20.8	141.1
Blood, hemopoietic organs, immunological	4.5	1.5	7.2	12.1	10.9	6.2	6.0

Note: Grouping was made in accordance with data in "Diagnosis-Related Groups." Fifth Revision. "Definitions Manual. Health Systems International," 1989, pp 25-513.

These data confirm the stable relationship between incidence of lesions to any system and age. In the structure of morbidity according to categories, as in the case of distribution of diagnoses according to classes, diseases of the upper respiratory tract in category III are in first place. Next in rank are diseases and disorders of the circulatory and musculoskeletal systems and connective tissue (181.2 and 180.0/1000), diseases and disorders of female reproductive organs (141.4/1000), diseases and disorders of digestive organs (114.3/1000). Thus, even rather radical regrouping leads to virtually the same fundamental conclusions: the age factor plays the deciding role, and organs and systems hold a rather stable place with respect to incidence and formation of pathology.

In overall morbidity, about 70 percent of all cases of disease consist of the 50 most widespread (over 5 percent incidence) pathological states grouped under three-digit entries in MKB-9.

Analysis of the main, most widespread forms of pathology according to indicator levels permits determination of the required correlations in the region under study,<sup>6</sup> that are required for decision-making in the area of improving medical care. Thus, one should consider osteochondropathy, the incidence of which is close to that of acute respiratory infections, to be the most widespread chronic disease among the adult population; chronic gastritis and duodenitis, and various forms of ischemic heart diseases (with the exception of angina) occur more often than

abnormal refraction and accommodation, which is so widespread in the contemporary population; the incidence of diseases of the gallbladder (about 40/1000) is just as high as that of cerebrovascular diseases, and that of chronic bronchitis, hypertensive disease and renal infections are also rather close (about 30/1000); disturbances of physiological functions of psychogenic etiology (about 20/1000) are on the same level as the incidence of acute bronchitis and bronchiolitis, and influenza; diabetes mellitus (18.1/1000), osteoarthritis and related disturbances (20.2/1000) are not far behind; such disease as hemorrhoids, cystitis, thyrotoxicosis with and without goiter,

adiposity, pneumonia, different sequelae of tuberculosis, and varicose veins are encountered at virtually the same incidence (7.0-10.0/1000).

One can distinguish the following subgroups in the structure of lesions to different organs and systems, on the basis of etiopathogenesis of their formation: infectious and parasitic diseases caused by specific pathogens, neoplasms, congenital abnormalities, injuries resulting from trauma and poisoning, and, of course, the main pathology of organs and systems proper originating from the distinctions of their structure and functions (Table 2).

**Table 2. Share (percentage) of diseases and disorders of different organs, systems and processes in overall structure of pathology grouped according to diagnostic categories**

Organ, system and process (MDS [expansion unknown])	Infectious and parasitic diseases	Neoplasms	Congenital abnormalities	Trauma and poisoning
Nervous system	0.96	—	0.3	9.2
Eyes	0.4	0.4	1.6	3.8
Nose, mouth and throat	0.6	0.1	—	1.0
Respiratory system	9.6	1.0	0.2	2.7
Circulatory system	—	—	0.8	—
Digestive system	6.7	1.9	0.2	—
Musculoskeletal system and connective tissue	0.2	0.8	0.6	10.7
Skin, subcutaneous tissue and breast	11.5	15.5	—	33.4
Endocrine system, nutrition and metabolism	—	4.2	—	—
Kidneys and urinary tract	0.7	1.5	1.2	—
Male reproductive system	57.2	3.2	—	—
Female reproductive system	8.6	11.5	0.2	0.9

Note: The rest of system diseases are unrelated to the indicated etiological variants. Taking this into consideration, the totals for each line should equal 100 percent. A dash indicates that the listed diseases and disorders were not encountered in the sample studied.

These approaches could serve as the basis for developing different variants of grouping statistical data in order to standardize approaches to evaluation of different aspects of morbidity.

6. In other regions, the correlations may differ, but apparently the main trend will be retained. ©COPYRIGHT Izdatelstvo "Meditina", 1991

#### Footnotes

1. Overall morbidity refers to the total number of recorded cases of acute disease and first visits for chronic disease per year as related to corresponding population groups.

2. MKB-9 since 1980.

3. Data were collected by a working team at the oblast health department (chief: N. N. Burdin, group leader G. P. Tretyakova). Diagnosis gathering and coding were carried out by a method approved in Order No 779 dated 29 October 1988.

4. Data were gathered for 1986 concerning all diseases recorded that year in a sample of 5,000 people.

5. "Diagnosis-Related Groups," Fifth Revision, "Definitions Manual, Health Systems International," 1989, p. 7.

#### Meeting the Public's Hospital Care Requirements in Novgorod Oblast

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[Article by V. A. Medik, Health Department of executive committee of Novgorod Oblast Council of People's Deputies]

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[Text] It is growing particularly important to improve health care standards with consideration toward the distinctions of its structure, morbidity rate and related hospital care requirements of the inhabitants of different regions, in view of restructuring of this sector under the effect of a new economic mechanism and change from sector-level to predominantly territorial forms of management.

The Health Department of the Novgorod Oblast Council of People's Deputies, jointly with the All-Union Scientific Research Institute of Social Hygiene, Health Care Economics and Management (SGE and UZ) imeni N. A. Semashko has carried out a comprehensive sociohygienic investigation of the health status of the population and scientific validation of future development of health care in this region on the example of Novgorod Oblast, which is typical of the northwestern economic region of our country. One of the final stages of this study consisted of solving problems of forecasting the public's hospital care requirements and elaborating scientifically validated standards for meeting these needs on different hierarchical levels of organization.

Since we attribute exceptionally great importance to reliable forecasts of hospitalization requirements and choice of optimum duration of hospital care in estimating the standards for the public's hospital care needs, we deemed it necessary to dwell on the main methodological approaches to their determination.

The public's hospital care requirements over the projected period (up to the year 2010) are determined by means of in-depth expert evaluation of the actual scope of hospital care on different levels of its organization and investigation of the need for hospitalization due to diseases that were additionally detected in the course of physical examinations [3]. Expert evaluations were made by highly qualified specialists of the Military Medical Academy imeni S. M. Kirov, Leningrad Pediatric Institute, specialized scientific research and oblast medical institutions. For this purpose, we used the method of individual analytical expertise followed by adjustment of obtained data by means of collective expert evaluation of the brainstorming type. Along with existing indications for hospitalization, in making their expert assessment the specialists were also

governed by the list of factors they elaborated that could, in their opinion, affect change in the public's hospitalization needs in the future.

The following were listed among factors instrumental in lowering hospitalization needs in the future: expansion of medical diagnostic work in polyclinics by organizing day hospitals, active treatment offices, rehabilitation departments; increase in scope of medical diagnostic work in the home by organizing hospital-type care in the home with due consideration of the patients' social and living conditions; organization of a network of sociomedical institutions of the support [relief] type for hospitalization primarily for social indications, open day hospitals at medical walk-in offices and base FAP [feldsher and midwife centers] with consideration of local settling systems; improvement of dynamic observation of chronic patients on the dispensary rolls, which would lower the incidence of emergency hospitalization; improvement of quality and efficacy of hospital care which would unquestionably lower the incidence of repeated hospitalization, projected decline of morbidity related to different nosological forms.

Among the factors that could affect a rise in hospitalization need, expert evaluation considered the following projected rise in morbidity for different nosological forms and classes of disease; rise in number of diseases requiring hospital care detected additionally at the time of medical examinations, provided there was proper organization, appropriate supply of diagnostic equipment and personal interest of citizens, expansion of opportunity for mothers with sick children to be hospitalized in pediatric hospitals.

As a result of computer processing of the data obtained from such multilevel expert evaluation, determination was made of projected indicators of hospitalization requirements of the adult and child population in terms of beds in 13 and 12 specialties, respectively (Tables 1, 2, 3).

**Table 1. Indicators of hospital medical care for adult and child population (for period up to 2010)**

Designation of hospital beds	Adult population				Child population			
	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000
Medicine	59.40	17.7	330	31.9	—	—	—	—
Pediatrics	—	—	—	—	56.50	13.0	330	22.20
Surgery	54.30	14.5	330	23.9	28.00	11.9	330	10.10
Obstetrics	32.60	10.2	310	10.8	—	—	—	—
Pathology of neonates and premature babies	—	—	—	—	6.10	31.2	300	6.30
Gynecology	46.80	6.5	330	9.2	0.39	19.1	330	0.23
Otorhinolaryngology	8.60	10.7	330	2.8	20.50	8.2	330	5.10
Ophthalmology	4.80	14.4	330	2.1	5.00	12.5	330	1.90
Neurology	13.50	19.6	330	8.0	5.40	18.9	330	3.10

Table 1. Indicators of hospital medical care for adult and child population (for period up to 2010) (Continued)

Designation of hospital beds	Adult population				Child population			
	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000
Tuberculosis	3.40	72.8	330	7.5	0.87	102.1	330	2.70
Psychiatry	7.10	80.9	340	16.9	2.65	70.6	340	5.50
Drug addiction	1.58	64.5	340	3.00	—	—	—	—
Dermatology and venereology	4.30	19.1	330	2.5	4.00	23.9	330	2.90
Communicable diseases	8.40	13.6	300	3.8	127.00	12.3	300	52.40
Oncology	7.10	22.8	330	4.9	1.24	12.2	330	0.46
Totals	251.90	16.7	330	127.3	258.40	13.8	315	112.90

Table 2. Indicators of hospital care of adult population on different hierachic levels of its organization for period up to 2010

Designation of hospital beds	Oblast level				Intersystem level				Rayon level			
	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000
Medicine	14.60	19.2	330	8.50	20.13	19.5	330	11.90	24.60	15.4	330	11.50
Surgery	13.06	17.9	330	7.10	20.05	15.6	330	9.50	21.20	11.13	330	7.26
Obstetrics	1.46	20.1	330	0.89	6.72	13.1	330	2.67	24.45	8.60	290	7.25
Gynecology	1.09	17.8	330	0.59	4.95	12.0	330	1.80	40.80	5.5	330	6.80
Otorhinolaryngology	1.64	12.1	330	0.59	6.96	10.4	330	2.20	—	—	—	—
Ophthalmology	2.03	14.6	330	0.90	2.77	14.3	330	1.20	—	—	—	—
Neurology	1.43	20.7	330	0.90	4.55	20.3	330	2.80	7.52	18.9	330	4.30
Tuberculosis	1.27	72.8	330	2.80	2.13	72.8	330	4.70	—	—	—	—
Psychiatry	0.64	47.6	340	0.90	6.46	84.2	340	16.00	—	—	—	—
Drug addiction	1.10	64.6	340	2.10	0.48	63.8	340	0.90	—	—	—	—

Table 2. Indicators of hospital care of adult population on different hierarchic levels of its organization for period up to 2010 (Continued)

Designation of hospital beds	Oblast level				Interrayon level				Rayon level			
	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000
Dermatology and venereology	1.95	20.3	330	1.20	2.35	18.3	330	1.30	—	—	—	—
Communicable disease	—	—	—	—	—	—	—	—	8.40	13.6	300	3.80
Oncology	4.28	23.9	330	3.10	2.82	21.1	330	1.80	—	—	—	—
Totals	44.55	21.9	330	29.57	80.37	23.7	335	56.77	126.97	10.3	320	40.91

Table 3. Indicators of hospital care of child population on different hierarchical levels of its organization for period up to 2010

Designation of hospital beds	Oblast level				Interrayon level				Rayon level			
	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000
Pediatrics	24.00	13.6	330	9.90	24.40	13.0	330	9.6	8.1	11.1	330	2.7
Surgery	22.50	12.9	330	8.80	5.50	7.8	330	1.3	—	—	—	—
Pathology of neonates and premature babies	3.34	32.3	300	3.60	2.76	29.4	300	2.7	—	—	—	—
Gynecology	0.39	19.1	330	0.23	—	—	—	—	—	—	—	—
Otorhinolaryngology	12.50	8.4	330	3.20	8.00	7.80	330	1.9	—	—	—	—
Ophthalmology	5.00	12.5	330	1.90	—	—	—	—	—	—	—	—
Neurology	3.64	19.0	330	2.10	1.76	18.7	330	1.0	—	—	—	—
Tuberculosis	0.87	102.1	330	2.70	—	—	—	—	—	—	—	—
Psychiatry	2.65	70.6	340	5.50	—	—	—	—	—	—	—	—
Dermatology and venereology	4.00	23.9	330	2.90	—	—	—	—	—	—	—	—
Communicable disease	8.43	18.5	300	5.20	27.80	15.4	300	14.1	91.9	10.8	300	33.1

**Table 3. Indicators of hospital care of child population on different hierarchical levels of its organization for period up to 2010 (Continued)**

Designation of hospital beds	Oblast level				Interrayon level				Rayon level			
	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000	need for hospitalization/1000	mean duration of treatment, days	mean bed occupancy, days per year	bed requirement standard/1000
Oncology	1.24	12.2	330	0.46	—	—	—	—	—	—	—	—
Totals	88.56	16.8	320	46.49	69.92	13.8	315	30.6	99.9	11.0	310	35.8

A comparison of estimates to factual data indicates that there is a projected increase in hospitalization using beds in departments of otorhinolaryngology, ophthalmology, neurology, oncology, and obstetrics, and decrease in hospitalization requirements in areas of general medicine, surgery, tuberculosis, dermatological-venereological, and communicable diseases. On the whole, however, we anticipate an 8 percent decrease in adult hospitalization and 11 percent increase in bed use in pediatric hospitals. At some stages of organization of hospital care of the adult population, it is possible to redistribute the scope of hospitalization in the direction of increasing the share of patients admitted to oblast and interrayon hospitals to 17.7 and 31.9 percent, respectively (in relation to total number of admissions), considering the increasing need for specialized care. The scope of pediatric hospital care should be distributed at its different stages in the following manner, according to our estimates: 34.3 percent on the oblast level, 27.1 percent on the interrayon level, and 38.6 percent on the rayon level.

Intensification of hospital bed use, one of the indicators of which is to reduce mean bed occupancy, is the constant concern of health care organizers and clinicians. However, this indicator cannot be absolutized, and its rise should not necessarily be considered a negative phenomenon; incidentally, shortening of duration of in-hospital treatment cannot be interpreted as positive in some cases. In the opinion of V. A. Minayev [2], it could only serve as a relative reference point in assessing various aspects of hospital performance.

Ye. A. Loginova is of the same opinion [4]; she believes that there are no standard indicators for duration of intramural care, noting that there are considerable reserves for making efficient use of bed resources.

According to the expert evaluations, there was an incomplete examination at the pre-hospital stage in 43.0 percent of surgical cases and 56.0 percent of medical cases, which prolonged treatment at oblast hospitals by 1.8 and 2.3 days, respectively. The following were included among medical-management flaws: unwarranted duplication of examination results at polyclinics in 21.0 percent of the cases, delayed intramural consultation in 11.0 percent, patients standing in line for examination due to overloading of diagnostic services in 12.0 percent of the cases,

which led to longer hospitalization by a mean of 1.6-2.7 days. Medical specialists who participated in making an expert evaluation of indicators obtained on the basis of actual situation over the last five years (according to statistical records) and those obtained as a result of special investigation, were governed by a set of factors affecting formation of indicators in their choice of optimum mean duration of patient treatment in different departments over the estimated period.

Of the factors affecting a decrease in duration of hospital care, the following were taken into consideration in preparing the expert opinion: prospects of using sophisticated diagnostic equipment and methods; improved continuity of forwarding test results from the outpatient-polyclinic network to hospital institutions on the basis of using computers and creating distributed diagnostic data bases; use of effective drugs and treatment methods; implementation of principles of differentiated patient treatment according to extent and intensity of treatment and care; organization of different types of sociomedical institutions.

In addition, due consideration was given to the fact that, with the change of health-care institutions to new management conditions and ultimately to principles of insured medical care, they will be directly interested in lowering treatment cost and, consequently, shortening hospital stays. At the same time, the switch to new financing and management conditions in health care institutions will inevitably lead to a shift of emphasis in the direction of predominant development of the network of outpatient-polyclinic type of institutions. This, in turn, will reduce the flow of admissions in hospital facilities, primarily due to mild course of acute and certain chronic diseases, which will inevitably lead to an increase in share of hospitalized patients with moderate and serious forms of chronic diseases requiring, of course, longer hospitalization.

All this has resulted in a thoughtful approach to the choice of optimum term of patient treatment in the different departments and level of organization of hospital care, which we used to elaborate scientifically validated projections of standards to meet the needs for different types of specialized hospital care of the adult and child population (see Tables 1, 2, and 3).<

The calculations were made in an automated mode using a computer, on the basis of a formed data base that contained estimated hospitalization indicators, mean duration of intramural treatment, number of days of bed use per year, separately for the adult and child population, as related to the main specialized departments (beds), in a differentiated manner for three stages of organization of hospital care. We thus obtained typological standards for hospital beds (per 10,000 population in the same age group) that would meet the future adult and child hospital care requirements for the region as a whole, as well as on the oblast, interrayon and rayon levels of its organization. Moreover, we obtained coefficients of distribution calculated for future hospital care standards at the three stages of its organization, and we also determined the structure of these standards for the region as a whole and each of the three stages.

A total of 125.3 beds/10,000 population are required to meet the future needs of the population of this region: 127.3/10,000 population of the same age for adults and 112.9 for children (see Table 1).

According to the estimates, the following variant of assigning bed resources of hospitals within the region is the wisest: It is desirable to concentrate 26.4 percent of the entire bed resources of the region on the oblast level, considering the continued development of very specialized types of medical, pediatric and surgical intramural care; it is deemed possible to increase the share of hospital beds to 41.8 percent on the interrayon level, first of all in specialties of otorhinolaryngology, neurology, psychiatry, drug addiction, medicine, surgery and pediatrics (specialized); 31.8 percent of the entire bed resources should be deployed on the rayon level, and this would permit organization of adequate departments in the seven main fields: medicine, pediatrics, surgery, gynecology, obstetrics, neurology, and communicable diseases.

The inherent distinction of our projected changes in the structure of bed resources is as follows: reduction in share of medical beds by decreasing beds for general medicine and transmittal to institutions of the sociomedical type; reduction in share of general pediatric beds in the structure of all children's beds by reassigning them to communicable patients; increased share of otolaryngology, ophthalmology, neurology and oncology beds and decreased share of beds to care for patients with tuberculosis, drug addiction and psychiatric pathology, as well as hospitalization of infectious (adult) patients.

To meet the public's requirements in sociomedical hospital care, with consideration of international knowhow in organizing such care for chronic cases and the elderly, the results of investigations carried out by staff members of the All-Union Scientific Research Institute of SGE and UZ imeni N. A. Semashko [1, 5], as well as projected age and sex structure of the population, we calculated a single standard for institutions of the sociomedical type: 52.5 beds/10,000 population, 13.2 per 10,000 are to be assigned to health care institutions on the local (75 percent) and rayon (25 percent) levels of hospital care. It would be

desirable to deploy the remaining 39.3 (per 10,000 population) sociomedical beds in so-called territorial sociomedical centers, the structure of which includes an outpatient medical office with day hospital, emergency care department (or brigade), housing for single and elderly people, and a social-activities complex. Unified territorial social insurance funds, which would stem from health care and social security budget resources, targeted contributions by enterprises, collective and state farms, and individual citizen contributions could serve as the source of financing such centers. Members of the Red Cross Society, various charitable funds and churches could provide needed assistance in organizing care.

The planning standards and organizational proposals elaborated as a result of this investigation served as the basis for a general plan of development and location of the network of health care and social security institutions of Novgorod Oblast for the period up to 2010.

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#### Smoking, Drinking and Health Status of Urban Population

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[Article by V. V. Belousov, Leningrad Institute of Physical Culture imeni P. F. Lesgaft]

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[Text] An analysis was conducted on the incidence of bad habits, smoking and intake of alcoholic beverages, as well as of the effect of the latter on incidence of colds and chronic disease, industrial trauma, time of appearance of fatigue on the job, quality and duration of nocturnal sleep, and self-assessment of health status within the framework of a sociological investigation carried out in 1988-1989.

We gathered the necessary information by means of a special questionnaire consisting of 74 questions. The answers to these questions enabled us to form an idea about different aspects of the lifestyle of residents of Leningrad. The screening covered individuals working or employed at 46 industrial enterprises, scientific research educational and other institutions in the city. We polled a total of 2,022 people ranging in age from 14 to 70 years, who represented different occupational groups of population.

The investigation was carried out using the following protocol: at first (1988) there was a preliminary (pilot) study ( $n = 805$ ) and then (1989) we increased the number of subjects to the level conforming to the requirements of this work. The final size of the random sample ( $n = 2,022$ )

constituted 10 percent of an arbitrary general set, as recommended for such work in [1]. The size of the general set was determined by the number of individuals (about 20,000) whom we screened in the period of 1984 to 1989 in order to investigate problems of improving the health of Leningrad residents by means of mass-scale physical culture. The obtained data were processed on a computer using traditional methods of health statistics, and the summary digital results of this study are concentrated in four tables.

Analysis of the data listed in Table 1 enable us to state that 40 percent of the Leningrad residents are smokers, 54.5 percent are males and 24.9 percent females. Table 1 lists data describing the burden, according to number of cigarettes smoked per day; it shows that this indicator is 2.5-10 times higher for males than for females.

**Table 1. Indicators of incidence of smoking and intake of alcoholic beverages among Leningrad residents (percent of total screened;  $n=2022$ )**

Smoking and drinking indicators	Entire population	Males	Females
Smokers, total of smokers	39.7	54.5	24.9
-including those who smoke: irregularly	13.8	14.0	15.6
-regularly, but no more than 10 cigarettes/day	11.2	15.2	6.7
-10-20 cigarettes/day	12.7	21.9	2.1
-20-30 cigarettes/day	1.9	3.2	0.4
-more than 30 cigarettes/day	0.1	0.2	0.1
Nonsmokers	60.3	45.5	75.1
Drinkers, total	68.9	78.5	59.4
-irregularly (on holidays)	66.6	74.6	58.9
-regularly (daily), less than 0.5 l/day	1.7	3.0	0.3
-0.5 l or more/day	0.6	0.9	0.2
Nondrinkers	31.1	21.5	40.6

Evaluation of data on distribution of smokers in age groups (Table 2) shows that the maximum number of smokers (49.6 percent) is in the group of relatively young people. They also showed the maximum burden according to number of cigarettes smoked. There is also a rather high percentage of smokers in the 14-20

and 31-40 age groups (35.9 and 44.7, respectively). A decline in number of smokers occurs closer to the age of 40. It is probably expressly in this period that experience and illnesses resulting from smoking compel some people to review their attitude toward this bad habit.

**Table 2. Incidence of smoking and alcohol intake according to age groups among Leningrad residents (percent of total screened;  $n=2022$ )**

Age group, years	Smoking						Drinking		
	non-smokers	irregular smokers	regular smokers, cigarettes/day			non-drinkers	irregular drinkers (on holidays)	regular drinkers, liters/day	
			to 10	10-20	20-30	over 30		up to 0.5	0.5 or more
14-20	64.1	15.2	12.4	6.5	1.8	—	51.2	48.8	—
21-30	50.4	17.0	15.3	15.3	1.7	0.3	25.1	73.5	1.0
31-40	55.3	16.3	10.9	15.7	1.7	0.2	25.7	70.6	2.8
41-50	67.1	14.6	7.1	9.0	2.2	—	34.1	62.9	2.2

Table 2. Incidence of smoking and alcohol intake according to age groups among Leningrad residents (percent of total screened; n=2022) (Continued)

Age group, years	Smoking							Drinking			
	non-smokers	irregular smokers	regular smokers, cigarettes/day				non-drinkers	irregular drinkers (on holidays)	regular drinkers, liters/day		
			to 10	10-20	20-30	over 30			up to 0.5	0.5 or more	
51-60	71.4	6.3	8.9	10.3	3.1	—	28.6	68.3	2.2	0.9	
Over 60	79.3	3.4	—	—	17.2	—	34.5	65.5	—	—	

According to Table 2, there is a considerable percentage of smokers in the 41-50 and 51-60 age groups. However, particularly among those over 60 years of age, we see a noticeable decrease in number of smokers. There are data to the effect that a considerable number of active smokers begin to expire intensively in this period [2-4].

As for the effect of smoking on the health of Leningrad residents, in order to define this correlation we submitted the obtained data to correlation analysis and the  $\chi^2$  goodness-of-fit test, with calculation of Spearman's coefficient of correlation and goodness of fit. The direct (linear) correlation was weak for virtually all analyzed indicators, only the link between smoking and industrial trauma was statistically reliable ( $p < 0.05$ ). This enables us to state that

there were the fewest or no cases of trauma among the subjects who were the heaviest smokers. The parameters of the goodness-of-fit criterion (Table 3) confirm this conclusion with a high degree of statistical reliability ( $p < 0.002$ ). Moreover, the goodness-of-fit test revealed that there is an indirect correlation between smoking and chronic morbidity (cardiovascular diseases, pathological changes in the gastrointestinal systems, involvement of the liver, kidneys, lungs, etc.), quality and duration of sleep, subjective evaluation of the subjects of their own health status. In other words, with increase in duration of smoking and in number of cigarettes smoked, there is also an increase in number of individuals with chronic diseases, sleep disorders and those with a poorer evaluation of their health.

Table 3. Indicators of goodness-of-fit criterion for smoking and alcohol intake in relation to health of Leningrad residents (n=2022)

Bad habit	Colds			Chronic disease			Industrial trauma			Quality and duration of sleep			Time of onset of fatigue on the job			Subjective assessment of health		
	$\chi^2$	$n'$	$p$	$\chi^2$	$n'$	$p$	$\chi^2$	$n'$	$p$	$\chi^2$	$n'$	$p$	$\chi^2$	$n'$	$p$	$\chi^2$	$n'$	$p$
Smoking	11.0	10	>0.05	12.3	5	<b>0.05</b>	125.7	20	<b>0.002</b>	43.5	15	<b>0.002</b>	7.9	15	>0.05	34.6	10	<b>0.002</b>
Drinking	22.9	6	<b>0.002</b>	2.3	3	>0.05	75.8	12	<b>0.002</b>	23.1	9	<b>0.002</b>	4.7	9	>0.05	13.5	6	<b>0.002</b>

Note: Chi-square—criterion of goodness of fit.  $n'$ —number of degrees of freedom.  $p$ —probability of error. Statistically reliable results are rendered in boldface.

Data on use of alcoholic beverages by Leningrad residents supplement the information about smoking. Table 1 shows that 70 percent of Leningrad residents consider themselves to be drinkers or irregular drinkers, and this applied to 78.5 percent of the males and close to 60 percent of the females. There were 10 times more (3 percent) males consuming up to 0.5 l alcohol daily than females (0.3 percent). Analysis of the data for different age groups (see Table 2) shows that the highest percentage of regular drinkers or heavy drinkers was among those who also smoked more and more often (21- to 30-year-old and 31- to 40-year-old). In the 41- to 50-year-old city residents, there is an 8 percent decrease in alcohol intake, as compared to the 31- to 40-year-old group. However, the relative number of drinkers increases again, by 5.5 percent, in the 51- to 60-year-old group. In the latter group, there is also an increase in number of individuals consuming over

0.5 liter of alcoholic beverages per day. We tend to attribute such dynamics to formation of a stable drinking habit.

As for correlation analysis, on the basis of its results we can state that there is no statistically reliable linear correlation between drinking and the health indicators used in this study.  $\chi^2$  analysis revealed an indirect and statistically reliable correlation between drinking and some indicators of health (see Table 3). A concretely noted correlation was found with increase in industrial trauma, colds ( $p < 0.002$ ), sleep disorders ( $p < 0.01$ ), as well as poorer self-assessment of health. In conclusion, we deem it necessary to also submit the results of the goodness-of-fit test of the results of our investigation, which were used to determine the relative effect of smoking and drinking on the health of Leningrad residents (Table 4). Such analysis was

carried out in order to rank the value for the goodness-of-fit test per unit degree of freedom ( $\chi^2/n'$ ). A comparison of these indicators, which are a function of reliability of the goodness-of-fit criterion, enable us to determine the significance of effect of each of the above-mentioned bad habits on the health of Leningrad residents. Table 4 shows that

drinking has a stronger relationship than smoking to the increase in number of colds and rise in industrial trauma. In turn, smoking has a stronger effect than alcohol on increasing the number of individuals with chronic diseases, who complain of sleep disorders and have a poorer opinion of their health.

**Table 4. Ranking of effects of smoking and alcohol intake on health of Leningrad residents as a function of goodness-of-fit test per unit degree of freedom ( $\chi^2/n'$ )**

Bad habit	Colds		Chronic disease		Industrial trauma		Quality and duration of sleep		Time of onset of fatigue on the job		Subjective assessment of health	
	$\chi^2/n'$	rank	$\chi^2/n'$	rank	$\chi^2/n'$	rank	$\chi^2/n'$	rank	$\chi^2/n'$	rank	$\chi^2/n'$	rank
Smoking	—	—	2.46	I	6.28	II	2.90	I	—	—	3.46	I
Drinking	3.81	I	—	—6.31	I	2.56	II	—	—	2.25	II	—

Note: The table includes only data with statistically reliable results ( $p < 0.05$ ) of goodness-of-fit test (see Table 3).

On the whole, as shown by the studies, smoking and drinking are directly or indirectly instrumental in worsening virtually all of the studied health indicators, and they lead to poorer work fitness.

Analysis of the findings enabled us to draw the following conclusions: smoking and alcohol abuse, as bad habits, are widespread among the residents of Leningrad. At the present time, virtually 40 percent are smokers. Among males, the figure is 54.5 percent and among females, 24.9 percent. With regard to age groups, the largest number of active smokers was found among those in the 21- to 30-year-old group (49.6 percent) and the smallest, among those over 60 years old (20.7 percent).

Thus, smoking is directly or indirectly involved in increasing the incidence of industrial trauma, chronic diseases, impaired quality and duration of sleep, as well as in lowering urban residents' subjective assessment of their health status. The number of Leningrad residents consuming alcoholic beverages, to some extent or other, constitutes 68.9 percent. Among males, 78.5 percent are drinkers or drink occasionally and this applies to 59.4 percent of females. With respect to age groups, the largest number of drinkers (up to 75 percent) was found among those who are the heaviest smokers (21- to 30-years-old and 31-to 40-years-old). Of the indicators of health status of Leningrad residents used in this study, the most negative correlation was established between regular drinking and increase in cases of industrial trauma, colds, sleep disorders, as well as decrease in subjective evaluation of physical condition.

The results of this investigation warrant the conclusion that health education and dissemination of information about a healthful lifestyle hold an important place in the control of smoking and excessive intake of alcoholic beverages. Such work must be done systematically among all age groups. However, young people 14- to 40 years-old merit the most attention, since a particularly large number of them have bad habits.

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#### Experimental Use of "Diplen" Medical Film for Hermetization of Intestinal Sutures

917C05664 Moscow KLINICHESKAYA KHIRURGIYA  
in Russian No 2, Feb 91 (manuscript received  
14 Feb 90) p 9

[Article by A. V. Gazaryan, Department of Disease Surgery No 2, Yerevan Medical Institute]

UDC 616.34-089.844+615.468.6

[Abstract] Diplen medical film was used as a matrix for the administration of gentamycin over sutures in the intestines of 45 dogs. Without the film, microbial growth was observed in 92 percent of the animals, but no growth was seen either with plain or gentamycin-containing film. Adhesions and abscesses were seen in the control group at days 3-50. Some loose adhesions were also seen with the film. Film resorption was found to be complete by day 50. Experiments on rats showed that the gentamycin concentration was maximal on the first day after surgery and the antibiotic was undetectable after the third day. The results obtained demonstrate the utility of Diplen film for gentamycin implantation in surgery on hollow organs. References 1. Russian

**Effect of Metal-Modified Carbon Sorbents and Quercetin on Course of Experimental Wound Process**

917C0566B Moscow KLINICHESKAYA KHIRURGIYA  
in Russian No 2, Feb 91 (manuscript received  
27 Sep 90) pp 11-12

[Article by M. Ye. Shor-Chudnovskiy, V. I. Bugayev, A. V. Grigoryev, N. T. Kartel, and S. L. Medvedev, Department of General Surgery, Kiev Medical Institute imeni Academician A. A. Bogomolts]

UDC 616-001-07-08

[Abstract] Copper and zinc ion modified sorbents, which had been previously demonstrated in vitro to have a bactericidic concentration significantly lower than unmodified sorbents, were used to treat 85 white rats with model purulent wounds. Use of the modified sorbent, both with and without supplementary administration of the leukotriene inhibitor quercetin, was shown to lead to a lessening of symptoms of infection and earlier resolution, when compared to chlorhexidine biglucogonate or unmodified sorbent. Formation of granulation was completely concluded in 23 days in controls, in 11 days with the unmodified sorbent, and in six to seven days with modified sorbent. Similar patterns were seen for epithelialization. References 1. Russian.

**Changes in Animal Internal Organ Microstructure Due to Hypoxia and Their Correction Using Low Molecular Weight Lymphopeptides**

917C0566C Moscow KLINICHESKAYA KHIRURGIYA  
in Russian No 2, Feb 91 (manuscript received 17 Oct 90) p 13

[Article by D. G. Khundadze, Central Scientific Research Laboratory, Kiev State Institute of Physician Training, USSR Ministry of Health]

UDC 616.3-001.8:591.2

[Abstract] The effect of the administration of antisystemotonin, low molecular weight lymphatic peptides, was studied in three mice exposed to acute hypoxia and 16 mice exposed to chronic hypoxia. Peptide administration prevented the changes in myocardial ultrastructure, mitotic activity of lymphoid organ cells, and alveolar pneumatization seen in control animals after acute hypoxia. When the peptides were administered after chronic hypoxia changes were seen, including some narrowing in vascular lumen and polymorphic mitochondria, but they were not as pronounced as in control animals. Administration of the peptides before chronic hypoxia gave more protection than administration after, but some changes were still observed. The results obtained demonstrate the antihypoxic activity of antisystemotonin.

**Computer Search for Giant DNA-Protein Complexes**

917C0466A Kiev BIOPOLIMERY I KLETKA  
in Russian Vol 6, Nov-Dec 90 pp 52-58

[Article by N. I. Lukina and T. R. Soydla, Leningrad Polytechnical Institute and Leningrad Institute of Nuclear Physics, USSR Academy of Sciences]

UDC 577.323:681.3

[Abstract] In an attempt to determine whether there exist patterns that would enable one to use just one nucleotide sequence to identify DNA sites that interact with regulatory and, possibly, other nonnucleosome proteins, the authors devised two programs for the computer search of DNA-protein complexes. The programs were based on the assumptions that DNA-protein interaction is usually limited to one side of the DNA and that the nucleotide composition on the side recognized by the protein differs from standard composition. That meant that the researchers were looking for spatially oriented anomalies of nucleotide composition. The first program was used to analyze the distribution of adenine, thymine, guanine, and cytosine on both sides of the double helix of a 2  $\mu$ m *Saccharomyces* yeast plasmid. The entire nucleotide sequence of the plasmid was examined for four nucleotides for two helical lead estimates: 10.4 and 10.0. The most prominent anomaly involved the G-C distribution at 10.4. The second program was used to check the region where the anomaly was found (nucleotide 2600 to 3600), for 15 different lead estimates, from 10.0 to 10.8. The data indicate that the anomaly the researchers found overlaps the REP3 (STB) locus, which participates in plasmid segregation and regulates transcription of the nearby genes. The anomaly was found to envelop some 250 nucleotides of the surrounding DNA. The programs developed by the researchers could be used to study the mechanism of oozing. Figures 4; references 10: 2 Russian, 8 Western.

**Computer Search of Nucleotide Sequences for Homology Sites With Possible Insertions/Deletions and an Evaluation of Their Statistical Significance**

917C0466B Kiev BIOPOLIMERY I KLETKA  
in Russian Vol 6, Nov-Dec 90 pp 59-63

[Article by I. A. Shakhmuradov and V. A. Gasumov, Institute of Botany imeni V. L. Komarov, AzSSR Academy of Sciences, Baku]

UDC 576.12

[Abstract] The most versatile of techniques for a computer search for homology sites is context analysis, which was developed by Solovyev and enables the identification of various types of repeating fragments within or between nucleotide sequences and the evaluation of statistical significance. The only drawback is that it does not allow the presence of possible insertions/deletions, which is encountered fairly often when sequences are being compared. The

researchers here report that they have developed a computer-based search technique that allows for possible insertions/deletions. The technique enables the identification of all homology sites with given characteristics (number of coinciding nucleotides, number of noncoinciding nucleotides, and number and size of insertions/deletions) in a nucleotide sequence or between two DNA (RNA) sequences. The technique is said to be especially efficient in searching out elements of secondary structures and in aligning sequences. Figures 1; references 8: 2 Russian, 6 Western.

**Mapping DNA Attachment Sites on Nuclear Scaffolding Via Graphic Representation of Long Nucleotide Sequences**

917C0466C Kiev BIOPOLIMERY I KLETKA  
in Russian Vol 6, Nov-Dec 90 pp 63-68

[Article by V. V. Shmatchenko and A. B. Berezhnev, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino]

UDC 576.315.42

[Abstract] A PROFILE program was used to map DNA attachment regions on nuclear scaffolding. The program performed an algorithm for producing graphs of nucleotide sequences on IBM PC-compatible computers (Bulgarian Pravets-16A). The source for the DNA sequences was the GenBank data bank. The researchers analyzed the nucleotide sequences of organisms representing various taxonomic groups, and they demonstrated the correspondence between typical S-profiles and DNA sites responsible for bonding to the nuclear scaffold. An approach described by Hamori (J. BIOL. CHEM., 1983, Vol 258 No 2) was used to plot the graphs. The specific technique that was used enabled a detailed analysis of the sites corresponding to the attachment sites on the nuclear matrix, for which only a percentage content of AT-bases is usually given. It identified a detailed distribution of AT- and GC-bases along the length of those sites. The presence of the typical S-profiles made it possible to identify potential attachment sites. The technique presented by the researchers enables the mapping of functionally similar sites on long DNA sequences (including those that have different primary structures for the same biological function), and it can serve as the basis for the screening of banks of nucleotide sequences via visual identification of functionally significant genome sites. Figures 2; references 19: Western.

**Isolation of Specific mRNA With Antiserum to p35 Protein of Vaccinia Virus Envelope and Mapping of the p35 Protein Gene**

917C0466D Kiev BIOPOLIMERY I KLETKA  
in Russian Vol 6, Nov-Dec 90 pp 83-89

[Article by A. I. Muravlev, N. A. Chikayev, N. A. Netesova, N. V. Cheshenko, A. B. Beklemishev, and N. P. Mertvetsov, All-Union Scientific Research Institute of Molecular Biology of the NPO Vektor, USSR Ministry of the Medical Industry, Koltsovo, Novosibirsk Oblast, Institute of Molecular Biology and Biochemistry, KaSSR

Academy of Sciences, Alma-Ata; Institute of Bioorganic Chemistry, Siberian Branch, USSR Academy of Sciences, Novosibirsk]

UDC 578.821.51:578.5:577.217.33

[Abstract] A specific mRNA is immunochemically isolated with the AC35(BEM) antiserum to the p35 protein of the L-IVP vaccinia virus virion envelope, and an analysis is performed of the localization of a viral gene hybridizing with the mRNA. The data obtained by the researchers indicates that a polypeptide with a molecular weight of 27,000 may be a precursor of the p35 protein and that a 26K gene located on the left end of the *HindIII* A fragment of the vaccinia virus DNA may be its gene. The cDNA synthesized on the mRNA hybridizes specifically with that gene. Figures 4, references 21: 4 Russian, 17 Western.

#### Acidic Polypeptides as Inhibitors of Repair of Double-Strand DNA Breaks

917C0466E Kiev BIOPOLIMERY / KLETKA  
in Russian Vol 6, Nov-Dec 90 pp 89-92

[Article by A. I. Medvedev and G. I. Revina, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

UDC 577.391

[Abstract] Various inhibitors completely suppress the restoration of eukaryote-cell double-strand DNA breaks induced by radiation, but they do so only at high concentrations. A new class of inhibitors—acidic  $\alpha$ -polypeptides—is described. In experiments involving aspartic and glutamic acids, a single layer of double-strand

cells from Chinese hamsters of clones 237 and 431 and of *HeLa* cells was exposed to  $\text{Co}^{60}$  radiation at a dose rate of 3.6 Gy/min at 37°C and 4°C. The peptides were found to be only mildly toxic and to produce complete inhibition of double-strand breaks that was reversible. Those features, plus their selectivity and their structural similarity to endogenous metabolites, make them promising for a number of studies involving, for example, the mechanism of formation of structural rearrangements of chromosomes and the role of unrepaired DNA breaks in radiation-induced reproductive injury and transformation of cells. Figures 2

#### Nitrogen-Fixing Species of *Klebsiella* Produce Indole-3-Acetic Acid

917C0466F Kiev BIOPOLIMERY / KLETKA  
in Russian Vol 6, Nov-Dec 90 pp 93-96

[Article by N. A. Kozyrovskaia, V. L. Makitruk, and E. Rukdashel, Institute of Molecular Biology and Genetics, UkrSSR Academy of Sciences, Kiev, University of Bayreuth, FRG]

UDC 577.1

[Abstract] Nitrogen-fixing bacteria isolated from *K. pneumoniae* and *K. oxytoca* were studied for their ability to produce indole compounds, including the growth hormone indole-3-acetic acid. The indole compounds were identified with thin-layer chromatography and were quantitatively analyzed with HPLC. The bacteria produced indole-3-acetic acid when L-tryptophan was added to the nutrient medium. Indole-3-lactic acid, indole-3-pyruvic acid, and indole-3-acetaldehyde were also found in the culture filtrates. References 21: 3 Russian, 18 Western.

**Intermediate Molecular Weight Blood Peptides as Endogenous Regulators of Lipid Peroxidation Under Normal Conditions and in Thermal Burns**

917C0563A Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 37 No 1, Jan-Feb 91  
(manuscript received 9 Jun 89) pp 23-26

[Article by B. M. Vaidman, I. A. Volchegorskiy, A. S. Puzhevskiy, B. G. Yarovinskiy, and R. I. Lifshits, Chelyabinsk Medical Institute]

UDC 617-001.17-07:616-008.939.15-39-  
02:615.366.153.96-001.17

[Abstract] The effect of administering intermediate molecular weight peptides isolated from the blood of either intact or burned dogs on peroxidative lipid metabolism was studied in vivo and in vitro. In vitro experiments were conducted using erythrocyte membranes, in vivo experiments were conducted using mice. The in vivo experiments demonstrated that the peptides had an antioxidant effect, particularly those isolated from the normal dogs. One of the fractions from the burned dogs significantly increased the accumulation of thiobarbituric acid reactive substances in erythrocyte membranes after UV irradiation, which is a pro-oxidative effect. The degree of increase in antioxidative effect in peptides from burned dogs, compared to those from intact animals, correlated with the increase in total peptide content. The results suggest the presence of nonspecific mechanisms, so that both antioxidative and pro-oxidative effects may be observed. The effect of the peptides on lipid peroxidation lasted 24 hours, despite the extreme instability of the peptides in biological systems. The effect was also dependent on the character of the lipids studied. A significant negative correlation was also noted between intermediate molecular weight peptide content and the level of primary lipid peroxidation products in the blood of 29 human donors. The results suggest that these peptides play a role in the regulation of lipid peroxidation. Figures 2; references 19: 17 Russian, 2 Western.

**Participation of Opioid Peptides in Regulation of Myocardial Protein Biosynthesis in Stress and Adaptation**

917C0563B Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 37 No 1, Jan-Feb 91  
(manuscript received 12 Jul 89) pp 63-65

[Article by L. V. Maslova, Yu. B. Lishmanov, and G. N. Smagin, Scientific Research Institute of Cardiology, Tomskiy Scientific Center, USSR Academy of Medical Sciences]

UDC  
612.173.1.015.348.017.2.613.863] 06:612.822.1 [547.95  
547.943

[Abstract] The effect of the administration of a synthetic leu-enkephalin analogue, D-ala<sup>2</sup>-leu<sup>5</sup>-arg<sup>6</sup>-enkephalin (dalagrin) on myocardial protein biosynthesis was investigated in stressed and adapted rats. Stress was found to decrease biosynthesis by 48 percent, similar to the findings of other authors. Stress raised glucagon levels by 220 percent and decreased insulin function by 50 percent. Dalagrin administration increased myocardial protein biosynthesis by 45 percent, RNA levels by 39 percent in intact rats. When dalagrin was given to stressed rats biosynthesis levels did not decrease below those of controls, while glucagon levels increased 99 percent. Hypoinsulinemia was not seen in these rats. Dalagrin caused glucagon levels in stressed rats to return to normal in two hours, and to decrease to 56 percent of normal after six hours, while without the drug it required six hours after stress for glucagon levels to normalize. Stress adaptation was found to be accompanied by stimulation of myocardial biosynthesis. Adapted rats exhibited less biosynthesis inhibition in response to stress. The results obtained suggest that natural opioid-like substances are involved in the "structural track" of the nonspecific stress adaptation process. References 18: 11 Russian, 7 Western.

**Conference on Nosocomial Infection**

91C0527A Moscow PRAVDA in Russian 21 May 91 p 6

[Article by A. Longnov: "Illness Acquired at a Hospital"]

[Text] What a pity it is, you would say, if someone underwent a course of treatment and, having spent some time at a hospital, infirmary or polyclinic, was discharged with a new and more serious illness! Alas, this happens in our hospitals. The scientific and clinical conference on nosocomial infection, which convened in the Moscow affiliate of the Interbranch Scientific and Technical Complex for Microsurgery of the Eye, discussed this in particular, as well as the difficult tasks put to Soviet health care.

The problem of nosocomial infection has acquired particular urgency in recent years, particularly in medium-sized and large medical institutions. According to the data of specialists, such infection strikes about 7 percent of the patients in our country.

G. Belikov, chairman of the biomedical commission of the All-Union Association of New Forms of Management and Social Initiative, candidate of medical sciences, believes that the government must finally become concerned about the sanitary and epidemiological structure of our country.

**Interview With Head of Latvian Physicians' Association**

91C0527B Riga BALTIYSKOYE VREM'YA in Russian 8 Jan 91 p 8

[Interview with Doctor Peteris Apinis, president of the Latvian Physician's Society and editor of LATVIJAS ARSTS, by Tatyana Andrianova: "Is Your Health in Your Purse?" First paragraph is BALTIYSKOYE VREM'YA introduction]

[Text] No one is satisfied today with the quality of medical care. How can medicine serve the cause of good health? In the opinion of Doctor Peteris Apinis, president of the Latvian Physician's Society and editor of LATVIJAS ARSTS, one solution would be to start charging for medical care.

[Andrianova] Mr. Apinis, please tell us, is free medical care doomed?

[Apinis] Apparently it is. In the first place, in the last few years, prices have risen for everything—medical equipment, electricity, patient nutrition, and so forth. There are simply insufficient subsidies from the state budget. On the other hand, free medicine has proven its insolvency on a national scale. We have come to the point that we have destroyed the mechanism that makes the physician responsible for his work and the patient, for his health. At present, there are no incentives for a physician to advance his qualifications: the skill of a specialist has an insignificant impact on his and his family's lifestyle. People no longer have faith in the efficacy of medicine and are ready to give their savings to someone who, in their opinion, could help them. And their choice is not always good. Such a situation has resulted in the practice by grateful patients of making "gifts," which are not infrequently valued at

more than 1000 rubles. Some freedom has been generated by medical cooperatives, which are often linked with higher-level health institutions and render to trusting patients services that are not on a high professional level.

Paid medical services would enable the patient to pick his own attending physician. Accordingly, there would be competitiveness to find the best representatives of this profession and it would force the weaker ones to learn more. I also believe that colleagues who are compelled to collect official payment for their services would be more conscientious.

Incidentally, an experiment in this direction was carried out in Bauska. A visit to a physician costs 1 ruble. Even this ruble demonstrated within a short time whom patients trusted with their health and wallet.

[Andrianova] In our opinion, how would the new system work? For example, I would go to a polyclinic....

[Apinis] ...even there you would not see the usual registry office that creates confusion more than coordination. Instead of lengthy conversations with the registry clerk you are given a double ticket that serves as a pass to the physician, it indicates that services have been paid for, and for the physician it serves as a receipt. You have the right to pick the physician yourself on purely emotional grounds, as a family tradition, or according to the condition of your purse, because the fees will vary for different specialists. And the physician will receive his 50 percent of the earned funds as a legitimate fee, he will pay taxes, and the rest will be used to pay for the premises, medical equipment, nurses, and so forth. The 130 rubles that is the average income of a physician at the present time would be a sort of subsidy for unemployment, for those who are less popular at the start under the market conditions.

[Andrianova] What if a person gets sick and simply has no funds available at his disposal?

[Apinis] In the first place, payments should be made primarily through social insurance. It may be provided by an employer or an individual. For example, in the United States, 30 percent of a person's income goes toward social insurance. But people of retirement age must be insured by the government for the time being.

[Andrianova] Do you believe that payment must be made for all medical services?

[Apinis] No. The 3.5 percent of the state budget that is allocated for health care should be used expressly to subsidize free medical care. I refer to emergency care, emergency surgery (traumatology, gynecology, neurosurgery), infectious diseases, AIDS, tuberculosis, oncological diseases, diabetes mellitus, bronchial asthma, psychiatry, delivery of babies, preventive care of mothers and children.

[Andrianova] Who is working on development of the concept of paid medicine?

[Apinis] A few years ago, the Physician's Society elaborated the concept of insured medical care. It was a vivid

phenomenon, but at that time it could not be implemented. It served more a political function in the struggle of our society with the Ministry of Health. At the present time, a group officially appointed by the Ministry of Health from the department of social hygiene and medical organization of the Latvian Medical Academy is working on a plan, but very slowly and, it would seem, ineffectively. We have a group of enthusiasts, also members of the Physicians' Society which is trying to solve this problem faster and, we hope, with the least detriment to the public.

[Andrianova] Good luck.

### **Ukrainian Health Minister Interview**

**91C0527C Moscow KOMSOMOLSKOYE ZNAMYA**  
*in Russian 13 May 91 p 4*

[Interview With Yu. P. Spizhenko, Ukrainian Health Minister, by Olga Unguryan, head of "Komsomolskoye Znamya" Young Students Department, telephone: 441-86-52, under the rubric "From KOMSOMOLSKOYE ZNAMYA Files": "Conversation With an Authority, Yuriy Spizhenko: 'Humanism Cannot Exist on Appeals Alone.'" First paragraph is KOMSOMOLSKOYE ZNAMYA introduction]

[Text] Yuriy Prokofyevich Spizhenko was born in 1950. He is a candidate of medical sciences and a member of the CPSU. After graduating from the Chernovtsy Medical Institute in 1973, he worked as a surgeon, chief physician, and head of the Zhitomir Oblast Executive Committee Health Department. He was deputy Ukrainian health minister from December 1986. He has been Ukrainian health minister since November 1989.

[Unguryan] Yuriy Prokofyevich, directness and independence is still a rarity for a ministry administrator. Don't you assume that you will simply be forced to leave some gloomy day?

[Spizhenko] It is quite likely. At any rate, at a recent Plenum of the Central Committee of the Ukrainian Communist Party, Comrade Gurenko spoke openly about my "immaturity" as minister and that my promotion to this position was too hasty. Apparently, the Central Committee chief believes that maturity of a minister is determined by the extent of his obedience. However, I "heard incorrectly," and do not regret it; after all, we were dealing with Chernobyl.

[Unguryan] We have already passed the fifth anniversary of Chernobyl. What next?

[Spizhenko] I believe that the period of making emergency decisions (correct or often incorrect) has also ended with this tragic anniversary. We must turn to long-range planning. Actually, after this fifth anniversary (I am firmly convinced) that the right to make mistakes should be eliminated in our country. I gave much thought to it, and consulted many specialists before my main objectives emerged. By attaining them, physicians would be able to draw out the entire "queue" of other problems raised by the Chernobyl tragedy.

In first place is the problem of victims among Ukrainian children whose thyroid was exposed to radiation. Next are the young teams of "liquidators" [decontamination workers?] of 1986 and 1987, who were downed by the Chernobyl zone. I also refer to people who live in contaminated areas. There has been a 10 percent increase in leukemia among them.

This is a very serious and complicated problem. It can be resolved by organizing three national Ukrainian programs: thyroid program, hematological program and program for rehabilitation and treatment of all diseases among the "liquidators" of the Chernobyl zone.

The second problem which acutely affects us, but exists everywhere, is that there is no agreement worldwide about the impact of the Chernobyl factor on rise in morbidity. There is virtually no epidemiology! For example, in Kiev, at the All-Union Center for Radiation Medicine (CRM), there is an entire institute dealing with epidemiology of radiation lesions, several laboratories and ... absolutely no results! None! It receives much financing, up to 10 million per year, from the budget of the USSR Academy of Medical Sciences. They say that he who pays calls the shots. But I think that, in spite of such a financing procedure, the Ukrainian Ministry of Health will take these issues under its jurisdiction. It is time to stop the endless analyses: people are not rabbits or rats. Dissertations will take place only if we are guaranteed some practical results.

The third problem is synergism, i.e., effect of radiation on man combined with that of other factors. At present it is difficult to determine what causes more disease, radiation or emissions from industrial enterprises and motor vehicles.

Let us consider, for example, four oblasts exposed to radiation. Kiev Oblast emits 234,000 tons of toxic agents per year, Zhitomir Oblast 93,000 tons, Rovno Oblast 76,000 tons, and Chernigov Oblast 67,000.

But now let us discuss the "leaders" [oblasts]. Dnepropetrovsk Oblast emits 2,800,000 tons, Donetsk 2,980,000, Kharkov 1,000,000 and Zaporozhye 900,000 tons. Let us see whether there is synergism in the radiation-stricken oblasts. Yes there is. But the pressure of chemical factors is much lower here. However, this pressure is simply monstrous over there! Now the ministry is faced with the question of how to approach the distribution of funds objectively, so that there is no emphasis on any one aspect. Lest there be a rise in morbidity rate in other oblasts because we underestimated the nonradiation factor. This is a question that was not posed anywhere before, but must be discussed. Because there are enough chemical factors to ruin the health of Ukrainian children even without Chernobyl.

The last of the problems of paramount importance is irradiation of Ukrainian residents by nonradiation sources. We have thousands of direct manifestations of the effect on man of "non-Chernobyl" radiation. Only now have we started to talk about radon, a natural radioactive gas. Control of this gas started in Europe 10 years ago, tens

of thousands of people were resettled from buildings made of radioactive chips, ventilation was improved.... The situation with radon is extremely serious all over the Ukraine. There are oblasts and rayons where man is exposed to 1500 becquerels from radon in residential buildings; this is 15 rem exposure of the entire body and about 70 rem for the lungs.

[Unguryan] That is very high!

[Spizhenko] It is tens of times higher than the Chernobyl burden. Lung cancer is advancing to first place in the structure of morbidity....

But Chernobyl, with all its tragic acuity, should not block these problems from us. I take this opportunity to address those who have to do with the distribution of resources, funds and finances—industrial enterprises, parties, organizations, the Ukrainian diaspora, and foreign organizations. Who wants to help us lower the radiation burden on man, not with words but rubles, dollars, liras, marks? We cannot manage without collaboration, not only in "big" science, but in concrete practical programs.

[Unguryan] Yuriy Prokofyevich, all of us will remember Chernobyl for a long time. And, I am certainly not the only one to hold an everlasting grudge against the very highest level of medical personnel who announced publicly in May 1986 that all was well.

[Spizhenko] You know, when I came to this position I was concerned the most about the fact that we are the only people who do not believe our physicians. Nothing could be more terrible than this.

Let me say frankly that our superior agencies caused discord between the Ukrainian people and the Ministry of Health. I do not condemn my predecessor, not for corporative reasons. It is simply that I wonder why he did not make known the data in his hands or at least the original text of his televised speech in the days when he returned from the United States. (Incidentally, many are unaware of the fact that Romanenko had not been in the Ukraine for the first 10 Chernobyl days.) The Central Committee simply crossed everything out and told him: "This is what you will say!.... And the second factor is that there were no professionals! Now, five years later, we are all bold, but then.... There were only three or four people in the entire Union who were knowledgeable. There was no objective assessment of the degree of danger. You do remember that the biophysicists reassured us: all is well, marvelous, you can go swimming and take sunbaths, but do it only with the windows shut.... The former minister is a surgeon, like me. What did I know about radiation at that time? Nothing.

[Unguryan] But on 29 April 1986, on the day that a telegram about the accident sent by Emergency Government Commission to Zhitomir, Spizhenko, chief of the oblast health department, gave orders to start preventive iodine therapy. Thousands of people, first of all children, received primary protection. Yet it was so difficult to make

this decision without instructions from superiors. But you did it. Why then did the physicians in Kiev fail to take the same action?

[Spizhenko] I do not know. At that time I was simply ... afraid. For the children.

[Unguryan] You know, a classmate of my daughter's (his blood tests are bad) said: "Why study, we shall die anyway." In my opinion such an attitude is not a rarity. Juvenile crime, for example in Kiev, has increased dramatically. This is the Chernobyl syndrome!

[Spizhenko] The Chernobyl factor is far from being in last place in this matter. That is unequivocal. We recently carried out sociological studies of adolescents. And, you know, I never read more terrible questionnaires in my life. Over half the questioned children responded: "I have no future." All over the world people of this age have dreams, imagination, and make plans. Our children, however, are faced with a very different future. Of course, if there are moreover even insignificant physiological deviations, such depressive states worsen. And our social conditions "help" too. First of all, we must feed our children! A proper diet! Unfortunately, our medicine does not know how to treat hungry children. At present it is difficult to find a family in which the child has a normal diet. According to our data, children's dairy food requirements are met to only 80 percent, even in regions of rigid monitoring. And 60 percent of the children suffer from hypovitaminosis—vitamin C deficiency.

[Unguryan] Yuriy Prokofyevich, you once stated that more than remorse is expected of medicine at the present time. And it is true, we are already tired of listening to group "confessions": entire agencies and economic sectors, rather than specific guilty parties, are expressing remorse. We want deeds now, instead of words....

[Spizhenko] Yes, efficient performance is expected of physicians. I am profoundly convinced that we need to alter not only the political and economic system, but also the health care system. Like the entire economy, it must join the market. What does this mean? First of all, establishment of our own industrial production. At the present time there are numerous "gaps" in the health care structure. And if we do not fill these gaps ourselves, we shall have to wait a very long time for some "kind uncles" from other ministries.

We have decided not to wait, but to act. We have set our course toward building small enterprises. At the present time, there should be a small enterprise with each solid hospital. Here is an example: suturing material for vascular surgery. This is an item that is extremely scarce in the entire country! But this shortage does not exist in the Ukraine. Why? Because six people were assigned to install several small machines at the Institute of Clinical Experimental Surgery and therefore, the republic's requirements were met. Several tens of thousands of needles with sutures are already being produced! Soon we shall turn to production of microsurgical sutures, which is an even more complicated and sophisticated industry. We can do it ourselves! But earlier, it was simply a matter that no one

would allow deployment of such activity: find people and give them wages from the budget that would prevent them from scattering to cooperatives. The same institute has now set up production of disposable robes, slippers, boots, and masks for physicians. While the Institute of Cardiovascular Surgery has solved in theory the problem of producing filters and blood oxygenators. The most acute shortage! We procured these items annually but only for hard currency. And this in essence slowed down cardiac surgery. There was nothing to filter blood! Now we shall have filters.

The Otorhinolaryngological Institute has already put a series of instruments on conveyers. Virtually all ear, nose and throat operations can be performed with our own instruments. Only surgical microscopes are in short supply. But we have held negotiations and production of microscopes and colposcopes will start already in 1992, at the Arsenal plant, in collaboration with German specialists. We shall produce a thousand microscopes and this will take care of our needs. Later, we shall be able to sell them to other republics and even other countries.

What about orthopedic instruments? At present, only an apathetic chief physician or orthopedist does not have our general-purpose kit produced by the Osteosynthesis Association (Zhulyanskiy Machine-Building and Vinnitsa Lathe-Building plants). For one-and-a-half years (!) we have fully met the requirements of the Ukraine for these instruments and materials. There are no problems. We already selling them outside the Ukraine. Recently, when a conference was held in Belgorod, we sold instruments worth 800,000 rubles. Just a few years ago this would have seemed fantastic.

[Unguryan] How did you manage to change fiction to fact?

[Spizhenko] Nothing can be solved following traditional routes. We borrowed 400,000 rubles from the ministry, paid substantial sums to people and told them that this had to be done in one year instead of six. And they did everything, from blueprints to the conveyers, in one year! Fantastic!

The Ministry of Health initiated another very interesting project. We have the Donetsk Metallurgical Plant, which was to be shut down due to toxic emissions into the environment. And there is the West German firm, Warex, which agreed, after negotiations, to deliver equipment to us worth a substantial sum. And virtually 12 percent of the activities of this enterprise would go to finance medical programs of the Kiev Relay and Automation Plant. And ultimately we shall get our own computers. (At the present time the Siemens firm supplies them to us.) And we also want to finance a program for ultrasonic medical diagnostic equipment. If we succeed, excess x-ray burdens will be eliminated and this is of particular importance to us, because of Chernobyl.

One can, I repeat, provide for oneself. And this must be done! We already have a drug that was put on conveyers within three months! I refer to decamethoxin. It was approved late last year, and the first batch, 200,000 packs,

was delivered to pharmacies already in April. We shall produce several million before the end of the year.

[Unguryan] In general, Yuriy Prokofyevich, it is simply amazing that at a time of universal chaos there was a sector that not only slowed down, but even set up production of new items.

[Spizhenko] Yes, at present we are perhaps the only sector that is still "afloat." There are no breakdowns in rendering emergency care. Operations are not performed under local anesthesia. Surgeons operate, without microscopes, with tremendous eyestrain.

[Unguryan] People are stocking up on drugs, just in case. I am guilty of this myself and by drugs in bunches, whatever is available.

[Spizhenko] One can understand people: they have no assurance that they will be misled one more time. Just as they were misled about prices, wages, the program for building of communism and housing by the year 2000.... Of course we stocked up and will continue to stock drugs. But this is not a solution. The Ukraine does not have its own pharmaceutical industry at the present time. Is it possible that such a large state, with 52 million population, is unable to take care of at least 50 percent of its drug requirements? Of course, there is not a single country that can meet its needs entirely: some drugs are produced, sold, while the rest are procured. That is the principle to which we too should change. Each year the Ukraine "consumes" drugs worth a billion rubles. Of this sum, 220-250 million in hard currency. So that if we were to invest at least 20 million (one-tenth!) annually, we would have about ten enterprises within 10 years that would produce up to 200 types of extremely scarce drugs. There is no other way! We shall never buy enough drugs or equipment, after all we are not a Monaco or Liechtenstein.

[Unguryan] You are called, not without reproach, the "industrial" minister: supposedly you should be concerned with organizing healthcare, rather than installing machinery in clinics.

[Spizhenko] Under our conditions, medicine must concern itself with these matters ... regrettably. Today, nothing can be pumped out of the health care system, not even using a whip or a carrot. All of the reserves have been exhausted. And if we do not deal with this ourselves, we shall face a stoppage tomorrow. The physician must be given instruments, equipment, drugs. Ultimately, he should be relieved of the burden of economic problems. Do you know what a chief physician of a rayon hospital, for example, spends on such matters? Fifty-sixty percent of his time! I remember how I had to cope at my hospital. On one occasion, I entered the operating room and, my goodness, there was snow on the windows. They furnished me with some soldiers who fixed up a good boiler room for me.

[Unguryan] You began your career in the "sticks." Where were you born?

[Spizhenko] In Vinnitsa Oblast. In a village 30 kilometers from a rayon center.

[Unguryan] Were there other physicians in your family?

[Spizhenko] No. My mother was a collective farm worker and raised me herself. At that time, they worked at the farm starting at six in the morning. They dug out sugar beets by hand, such good diggers, I remember them well, I remember helping my mother after school. The digging would go on until dark, then the clean-up with knives. At night they would load the trucks. Up to 2 to 3 o'clock in the morning.... then we would sleep for three hours and back to work. I do not know how my mother could stand it. I wish I were as strong as she!

[Unguryan] Still, it would be a sin for you to complain, you are the youngest minister.

[Spizhenko] Not the very youngest. The forestry minister is younger. In general, it is somewhat funny: as far back as I can remember I was always with the young people: the youngest chief physician, oblast health department chief, and so forth. I am now 40 years old and still "the youngest." No, The English are right: the color of a cat does not matter, but being a good mouser does matter.

[Unguryan] Be that as it may, Yuriy Prokofyevich, your career advancement must be described as brilliant and swift. Probably, there was some outside help.

[Spizhenko] What are you driving at more precisely?

[Unguryan] Well, there are rumors about your high-level sponsor.

[Spizhenko] They say that I am the son-in-law of the former first secretary of the Zhitomir Oblast Party Committee, V. M. Kavun?

[Unguryan] Yes.

[Spizhenko] I must disappoint you. I am not V. M. Kavun's son-in-law. Vladimir Timofeyevich Sanzharov, an artist, is my father-in-law. He lives in Chernovtsi.

[Unguryan] Thank God!

[Spizhenko] Just a minute, what do you know about Kavun? I was in Zhitomir before and after him. And, God willing, there are such first secretaries in every oblast. It is a pity that he got "hit" by the train of certain events, because he could have been of very great benefit.

[Unguryan] Still, why did such rumors crop up?

[Spizhenko] He was merely kind to me. In general it is a rarity for first secretaries of party executive committees to notice and appreciate the work of physicians. Their attitude is usually the same as that of Peter the First: you are a physician, march to the left flank. It so happens that I was able to establish 300 feldsher-midwife centers in a couple of years. The number of abortions dropped to one-third the former number. Urgent operations virtually disappeared, and there were only scheduled ones. We were rather successful in control of cancer of the stomach and cervix, and hypertension. Incidentally, at present there has been a decrease in incidence of stroke in Zhitomir Oblast. Everywhere else it is on the rise, but there it has declined. In general, the work done was perceptible! And I was

treated with respect. But for others this seemed incomprehensible, why so? He must be a relative.

[Unguryan] Yuriy Prokofyevich, Tolstoy wrote a remarkable phrase: in spite of all of the physicians' efforts, the patient recovered. As we see, in the times of Lev Nikolayevich there was a different attitude toward "formal" medicine. Still, if we make a comparison to the same year of 1913.... Do you not think that much of the old medical practices is irrevocably gone? I am referring primarily to sensitivity, attention to the patient, humanism.

[Spizhenko] Well, this is unequivocal. Ever since we decided to make the people happy with free medicine (and anything that is free is not appreciated!) all values were lost, including health. Just look: there are two concerned parties, the physician and the patient. Is the patient doing everything he can for his own health? By far not everything. He does not realize that one should take better care of one's health than, for example, a refrigerator or car. One should take care regularly! We have not been trained to do this. And we have no incentives to do it. But what if things were different: if I am sick I pay insurance, 5 percent of my salary; when I am in good health I keep this money. If I am not sick for 20 years I will have 1000 rubles that will be given to me when I retire. Is that an incentive? Yes. This is why I believe that we need to change to insured-budgeted medicine. I have had occasion to pose a question to different audiences: what do you want, free medicine or good paid medicine? The answer is unanimous: good paid medicine. But there must be a guarantee of good drugs, proper treatment, and, mainly, guaranteed health!

[Unguryan] Incidentally, a patient has no guarantees at all at the present time, he is not protected....

[Spizhenko] Quite correct. A physician may be in a bad mood or poorly qualified, and he will perform an operation poorly. Where is the guarantee that a patient is insured against this? We have prepared a draft, for the Supreme Soviet, a Health Law. The law would protect the patient's interests and control the physician's lack of professionalism. In this area I have no intention to adhere to the corporate spirit.

[Unguryan] What are your intentions?

[Spizhenko] A few days ago I had a serious conversation with representatives of the Ministry of Finance and Ministry of Labor. They reproached me for insisting on raising the wages of Ukrainian medical workers in excess of the Union average! They receive letters from workers who are incensed that a physician receives the same wages as a milling machine operator. But I answered that the wages for a good milling machine operator should be one-third the amount for a good physician.

Everything has been set upside down in our country. All over the world the labor of a physician is rated very highly. We, however, are used to expressing ourselves in terms of appeals and invocations. We are often hypocritical, being well aware of it. Oh dear, how can that be! Oh dear, the Hippocratic oath!" A physician cannot feed his child and his aged mother with the Hippocratic oath. A physician is

a person just like everyone else. Humanism cannot exist on appeals alone. In this matter I shall abide by the corporate spirit and defend my colleagues.

[Unguryan] Yuriy Prokofyevich, it would probably be strange if your long-suffering ministry received no complaints.

[Spizhenko] There were very many complaints from "liquidators." We established several councils and the number of complaints dropped visibly. There are many complaints about psychiatry. Our hope in this respect is the recently founded Association of Ukrainian Psychiatrists headed by, can you guess who? Gluzman. Yes, that very same different-minded Semen Gluzman who made a long-distance expert evaluation for General Grigorenko.

So that very much could have been accomplished quietly, if there were no interference. But our system binds us hands and feet. Efficiency is very low, it takes time. Why do I work 14 hours a day? Because I could not manage otherwise.

[Unguryan] You do have time for something other than work?

[Spizhenko] My daughter tells me: "You know, Dad, of course I am proud that you are the minister. But I often think it would have been better if you were simply a doctor, so that we could drive to the forest with friends, have some talks, as we did before."

[Unguryan] Yuriy Prokofyevich, you did not become a Pirogov. But still, you are minister albeit "disobedient." Let us talk about privileges?

[Spizhenko] A minister is entitled to a car, and I have one. He is entitled to a state dacha [country house], but I turned it down.

[Unguryan] Why?

[Spizhenko] A state dacha is the same minister's office. Even as a small boy I wanted to have my own house. Now, with some friends, we have bought an old house for three [families]. I would like to build my own house with a workshop. And a vegetable garden where my son could pick cucumbers and eat them unwashed, in spite of hygienic rules.

[Unguryan] Forgive me for another indelicate question: How healthy is the Ukrainian government in your opinion?

[Spizhenko] It is not in fashion at the present time and even improper to say something kind about the administration. But, probably God does exist after all. And the tandem formed here of Kravchuk-Fokin is apparently the main guarantee that no blood will be shed in the Ukraine, no matter how much someone would wish it to happen. I think that these are the people whom the Ukraine needs at the present time and who are following the correct route, toward sovereignty, toward economic independence, toward a market economy.

[Unguryan] Lastly, Yuriy Prokofyevich: why are you involved in politics? What can you gain?

[Spizhenko] Personally, nothing. I am "sticking my nose" into politics for the sake of our children, for the sake of their future. If we do not live for them, what is the purpose of life?

[Unguryan] I thank you for the interview, Yuriy Prokofyevich! And I wish you good health.

### Health Care Problems in Shostka

917C0527D Kiev RABOCHAYA GAZETA in Russian  
6 May 91 p 1

[Article by L. Ryzhkova, member of Permanent Commission for Protection of Health and Labor of Women, Motherhood and Infancy, Physical Culture and Social Security of Oblast Soviet of People's Deputies, and V. Mironenko, department head of oblast newspaper LENINSKA PRAVDA, Sumy Oblast: "How Deputies Remembered Hippocrates in Shostka." First paragraph is RABOCHAYA GAZETA introduction]

[Text] It is not by chance that the Permanent Commission for Protection of Health and Labor of Women, Motherhood and Infancy, Physical Culture and Social Security of the Oblast Soviet of People's Deputies selected Shostka, the city of chemists, for its visiting meeting. An oblast "record" was achieved there with respect to morbidity involving temporary disability: 1,125 days per 100 workers per year. Unfortunately, this is a tendency that is directed toward the rise of a gloomy indicator.

One of the causes is pollution of the ecological environment, in which Shostka residents literally drink chemical "cocktails." They are "mixed" by more than 20 installations within the city limits. Last year, there were salvos of emissions from the Desna Production Association and the Chemical Reagent Plant. Some populated centers in the [Shostkinskiy] Rayon were under the ominous wing of Chernobyl. All this is unquestionably reflected in the diagnoses of Shostka inhabitants. In the last five years, there has been a rise in congenital abnormalities, morbidity, particularly that related to malignant neoplasms, hypertension, and bronchial asthma, in the city and rayon.

Can local physicians cope with such a splendid bouquet of diseases?

Commission members noted substantial flaws in the performance of city and rayon medical institutions. In particular, with regard to organization and quality of preventive exams and mass health screening. The principal barrier that prevents medicine from coming closer to the needs of the public, in the opinion of the commission, is the poor material base of medical institutions. Most of them are located in buildings built before the revolution. In 1985, the Shostkhemstroy Trust began construction on a medical unit for the Desna Production Association, at an estimated cost of 4.5 million rubles; but in five years, only 1.7 million were spent. There is no real organization to this day of work on this long-term construction project, which has already become an eyesore in the city.

It is common knowledge that before controlling a disease it has to be identified, and to do this one must have appropriate equipment, both diagnostic and therapeutic. This is why, for example, enterprises in the oblast center have allocated to Sumy medical institutions funds amounting to 5 million rubles over a five-year period for acquisition of equipment. Their administrators knew that industry could not develop in the presence of health care regression. And the management of Shostka enterprises probably know it too, but they allocated only 6,000 rubles over a five-year period for acquisition of medical equipment. What can be acquired for such a pitiful sum?

Incidentally, V. G. Moskalenko, deputy of the municipal soviet, proved that enterprises under Union subordination do have money. Enormous funds were recently taken from the city by specialists invited from other areas who had an ultrasonic machine for scanning human organs. Why not purchase such a machine for Shostka? Why not open a diagnostic center? So that people could not only be examined, but have the opportunity to be treated effectively.

The tiniest Shostka citizens turned out to be in a difficult situation. Each infant, not yet born, already receives "his own" dose from toxic industries. At the same time, erection of a dairy kitchen that would provide the babies with good foodstuffs is being delayed. We are also alarmed by the following: There are plans to improve the health of preschool and school children; however, the oblast sanitary and epidemiological station has not yet furnished its conclusions as to whether or not camps and bases within the limits of Pirogovka, which has a high radiation background, could be used for vacations. There was also talk at the meeting of the problem of housing for medical workers. The Hippocratic oath echoes proudly, said the deputies, when the physician and his family have a roof over their heads, and are aware of the need for them. Yet in Shostka, there are 179 medical workers on the list for apartments. Last year, only one apartment was provided. That is why specialists do not tarry there. In the last three years 47 physicians came and 66 left the city; there was a gain of 271 midlevel medical workers and a loss of 180.

The Health Ministry has given its approval for opening a medical school in Shostka. It is now in its second year and attended by 120 people. But the city executive committee has still not kept its promise to provide space for the school. Its entire base consists of about ten crowded little rooms somewhere. And there are already rumors from the ministry that, with such an attitude on the part of the city administrators, the school will be shut down. True, there is a tendency toward changing this situation. Yu. S. Serbin, chairman of the city soviet, has taken personal charge of construction of the medical unit. This is not an easy burden for him since construction costs have doubled since 2 April and he has to seek for "over-plan funds" in the local budget, which is already full of holes.

The members of our commission expressed quite a few reproaches to management of Shostka enterprises. The deputies had hoped to hear some arguments. But, no

amount of coaxing by V. K. Musiyenko, chairman of the permanent commission, could induce any of the directors in attendance to respond.

#### Misdiagnosis Rate as High as Fifty Percent in Turkmenistan

917C0532A Ashkhabad *KOMSOMOLETS TURKMENISTANA* in Russian 8 Jun 91 p 4

[Article by Tatyana Berdnikova under the rubric "Social Laboratory": "The Dead Are Teaching the Living"]

[Text] "We are the ones that no one likes and everything living damns," is the way representatives of one of the least prestigious specialties, pathology, speak of themselves.

"The first autopsies were performed in Russia in 1704, when by order of Peter the First medical hospital schools were founded.

The first Russian autopsy room where healers learned pathological anatomy and performed dissections was the anatomy theater organized in 1707 at the Moscow Hospital (presently the Main Military Hospital imeni N. Burdenko). This institution was the first educational base for theoretical and clinical medicine in Russia. There were special instructions on performing autopsies on patients who died in hospitals and comparing the clinical data to the pathological findings.

However, autopsies were performed irregularly, and this is attributable to a considerable extent to religious prejudices and obstacles created by the clergy. It is only after the department of medicine was opened at Moscow University in 1755 that autopsies began to be performed more often.

In 1849, Russia's first department of pathological anatomy was opened in the department of medicine in Moscow.

The event that took place in April of this year in Ashkhabad can no doubt be also classified as historical. For the first time in the last 20 years, pathologists, clinicians, and representatives of the Turkmen Ministry of Health met together. This seminar is also remarkable for the fact that it was the first one for the Republic Pathology Office. This youngest Union office was opened in February 1990. Previously, the pathology service was situated at the hospital and under the immediate jurisdiction of the chief physician who often had an influence on the outcome of an autopsy. The advantage of such an office is independence; it is under the jurisdiction of the Turkmen Ministry of Health, and it can carry out its chief function, which is a controlling [or monitoring] one. In general, constant contact between pathologists and clinicians, with comprehensive discussion of cases where there is disagreement of diagnoses, is essential to improvement of therapeutic work. The office suggests organization of a self-styled raid—to send pathologists to different rayons to perform autopsies and attend clinical-anatomical conferences. Its material and technical base is still rather poor, although in general the office proper is provided for rather well. A two-story building is under construction. It is planned to organize a cost-accounting enterprise for this office in the near future, for the purpose of rendering religious services.

The main objective is to increase the prestige of their specialty and to provide a material intensive for employees.

Few are aware of the fact that, in addition to autopsies, pathologists are involved in another unquestionably important matter, they help identify illnesses in the living. This analysis is called a biopsy. What it amounts to is that a piece of tissue from an organ is taken from an individual and a diagnosis is made within a few days. Pathologists often become participants in surgery. While the patient is on the operating table, the pathologist carries out a high-speed biopsy and furnishes a finding within 20-30 minutes. It would be difficult to exaggerate its importance.

At the present time, this is the prevalent direction of work of pathologists, while the number of autopsies has diminished considerably. It would seem that this is gladdening news, but, as shown by the seminar, alas there are no grounds for joy. The reduction in number of autopsies did not occur because of improved diagnostics and performance of attending physicians; rather, the opposite holds true. In the last three to four years, physicians, who prefer to release the remains to relatives bypassing the morgue, are to blame for the failure to perform autopsies on most of the dead. This is done when the diagnosis is unclear. Sometimes, clinicians attribute their actions to the religiousness of relatives of the deceased. But yet, autopsies are necessary, and first of all to us, so that attending physicians would not make mistakes that cost us our lives. And if all the deceased were submitted to autopsies and clinicians were always present at post-mortems, I think that the mortality rate in our republic, particularly among children, would be lower.

In spite of all the contrivances to which clinicians resort, in order to conceal their mistakes, the percentage of divergent diagnoses is impressive.

"In 1990," states Farkhad Akhmedovich Nizamov, chief of the Republic Pathology Office, "the percentage of disagreement of autopsy and clinical findings in the city of Ashkhabad alone was 19 to 23 percent. This is 2-2.5 times higher than the Union indicator (9-11 percent). In outlying areas the figure reaches 40-50 percent. In essence, the discrepancies are related to oncological, cardiovascular and psychiatric diseases. This means that the level of training of specialists for preventive medical institutions is extremely low. Just remember the poor rating given to the Turkmen State Medical Institute last year. Literally a few years ago, before performing a new operation, physicians would perform on a cadaver for months, and only later, after having examined everything comprehensively and, to put it crudely, after acquiring skill, would they move to the operating room. This does not happen today. One should bear in mind that the attending physician is, after all, a narrow specialist, unlike the pathologist who has to know everything. After all, people's lives depend on professionalism.

"However, clinicians' mistakes are not punishable in most cases. No, I did not misspeak. A physician can pay for his so-called mistake, which cost the life of one of us, in the form of a reprimand, demotion or referral to a center for additional training. Hence, perhaps, such an attitude toward patients. Incidentally, they say that when cattle die at a collective farm the chairman writes up all sorts of documents for each lamb, he has to account for it. In my opinion, it is imperative to institute legal responsibility for medical 'mistakes'; there must be accountability, and very strict at that. It would not be frightening to be put in a hospital, when there is a law about the physician's responsibility to his patient. The Hippocratic oath alone no longer suffices."

**Comparison of Number of Chromatid Aberrations and Dose Assessed From Frequency of Dicentrics in Cytogenetic Study of Lymphocytes in Victims of Accident at Chernobyl Nuclear Electric Power Plant**

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Vol 30 No 5, Sep-Oct 90 (manuscript received  
10 Oct 89) pp 585-587

[Article by V. Yu. Nugis and A. A. Chirkov, Institute of Biophysics, USSR Ministry of Health, Moscow]

UDC 577.391.612.014.2.621.311.25

[Abstract] The average frequency of dicentrics in PHA-stimulated cultures of peripheral blood lymphocytes is used most often for cytogenetic dose assessment in individuals who have undergone acute, relatively uniform irradiation. That type of chromosome aberration is used as a biological dosimeter for several reasons, one of which is the fact that dicentrics and other polycentrics have a characteristic exterior, which makes them fairly easy to identify. In addition, the spontaneous frequency of dicentrics is very low, ranging from 1 to 10 per 10,000 cells. With a number of authors having demonstrated the formation of chromatid-type aberrations when cells are irradiated in the presynthesis phase, the researchers here were prompted to assess the yield of chromatid-type aberrations as a function of dose after actual irradiation of humans. To do that, they used the results of cytogenetic analysis of lymphocytes of peripheral blood and marrow from victims of the Chernobyl accident, the overwhelming majority of whom the leading factors were external, relatively uniform  $\gamma$ - and  $\beta$ -radiation and the application of  $\beta$ - and  $\gamma$ -active radionuclides to the skin. In most cases, when chromatid-type aberrations were found, there were more chromatid fragments than chromatid exchanges; seldom did a cell contain more than one aberration. When the researchers graphed frequency of chromatid aberrations against dose level, they found the curve to be virtually parallel to the x-axis at 0.5 Gy. At high doses, the average frequency of chromatid aberrations tended to grow with dose. At the same time, the researchers found that frequency of chromatid aberrations could vary considerably from individual to individual. Figures 1; references 6: 4 Russian, 2 Western.

**Monitoring Seeds of Chronically Irradiated Natural Populations of *Plantago lanceolata* L.: Radiosensitivity of Seeds**

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Vol 30 No 5, Sep-Oct 90 (manuscript received  
10 Apr 89) pp 588-592

[Article by O. N. Popova, N. P. Frolova, and A. I. Taskayev, Institute of Biology, Komi Science Center, Ural Branch, USSR Academy of Sciences, Syktyvkar]

UDC 577.391.621.311.25.004.65

[Abstract] *Plantago lanceolata* L. seeds from the three first generations obtained from different populations in the 30

km dead zone around the Chernobyl Nuclear Electric Power Plant were tested for radiosensitivity via the widely used provocative  $\gamma$ -irradiation technique. The populations had been exposed to different radiation levels in the fallout, but exhibited no noticeable differences in mass, germination, or mutability. The researchers found that the seed population from the 1986 generation produced rather similar responses to the massive  $\gamma$ -irradiation, independent of the background radiation levels at the collection site. In the two subsequent generations, seeds collected from sites that were more heavily contaminated were more vulnerable to irradiation. Their response was characterized by a greater increase in terms of the initial level of cells with structural chromosome damage in the initial meristem of the rootlets of the sprouting seeds and by a more pronounced delay in the initial growth processes. That indicates a genome instability resulting from chronic exposure to ionizing radiation. References 5: 4 Russian, 1 Western.

**Effect of Cystamine and Diethylstilbestrol on Proliferative Activity and Differentiation of Bone Marrow Cells**

917C0361C Moscow RADIobiologiya in Russian  
Vol 30 No 5, Sep-Oct 90 (manuscript received  
11 Sep 89) pp 593-597

[Article by V. G. Vladimirov, T. D. Pozharinskaya, S. M. Smirnova, and Ye. N. Sokolova, Scientific Research Institute of Military Medicine, USSR Ministry of Defense, Leningrad]

UDC 577.391.615.771.8.612.419

[Abstract] Researchers have reason to believe that, depending on properties and mechanism of action, radioprotectors either help prevent reproductive death of cells or enhance the proliferative activity of the cell pool of hemopoietic tissue remaining after irradiation. Since the latter possibility is little studied, the researchers here examined the effect of cystamine and diethylstilbestrol—radioprotectors of different classes in terms of their structure and mechanism of protective effect—on colony-forming ability, proliferative activity, and differentiation of cells of irradiated bone marrow in mice. Extramedullary colony formation was used in the mesentery of the small intestine. The researchers found that the radioprotectors amplify the proliferation of cells and change the direction of their differentiation by increasing the proportion of the granulocytic population. The higher number of labelled colonies and DNA-synthesizing cells found in them may be related somewhat to the change in direction of differentiation toward the granulocytic series, whose cells exhibit greater proliferative activity. The high degree of heterogeneity of cells capable of forming colonies suggested that the protective action of the preparations is also manifested in an increase in the number of divisions in a population. The increase the researchers found in the number of proliferating cells and colony size is probably not due to a shorter mitotic cycle. Figures 2; references 13: 8 Russian, 5 Western.

**Systemic Hemodynamics and Blood Supply in the Brain After Irradiation With a Supralethal Dose**

917C0361D Moscow RADIOPHYSICS in Russian  
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pp 598-601

[Article by V. G. Vladimirov and Yu. G. Boyko, Scientific Research Institute of Military Medicine, USSR Ministry of Defense, Leningrad]

UDC 577.391.591.48

[Abstract] Exposure to high doses of ionizing radiation leads to marked disturbances in the function of the central nervous system, sometimes causing the body to partially or completely lose its capacity for activity. In the work reported here, the researchers studied early disorders affecting systemic hemodynamics, as well as blood supply and oxygen supply in the brain in rats exposed to superhigh 300 Gy doses of  $\gamma$ -radiation at a rate of 1.9 Gy/min. The findings indicate that circulatory hypoxia and tissue hypoxia occur in the brain soon after exposure. Figures 3; references 12: 6 Russian, 6 Western.

**Role of Serotonin and Histamine in Neurohumoral Mechanisms of Postirradiation Diarrhea in Rats**

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Vol 30 No 5, Sep-Oct 90 (manuscript received 31 Oct 89) pp 607-612

[Article by V. I. Legeza, M. G. Shagoyan, I. V. Markovskaya, T. P. Vasilyeva, T. D. Pozharinskaya, I. I. Alekseyeva, and O. I. Lokteva, Scientific Research Institute of Military Medicine, USSR Ministry of Defense, Leningrad]

UDC 577.391.611.47

[Abstract] Little research has been published on the pathogenesis of postirradiation diarrhea, but disruption of the serotonin and histamine metabolisms is known to play a substantial role in diarrheal syndromes unrelated to irradiation. Some researchers have demonstrated that systemic administration of those amines results in diarrhea and is accompanied by stimulation of the evacuatory and secretory function of the intestine and by suppression of absorptive capacity. In light of that, and in light of the existing data that indicate that high doses of radiation stimulate serotonin and histamine release, the researchers here studied the role of those amines in the postirradiation syndrome of diarrhea. A total of 424 albino rats were exposed to 200 Gy  $\gamma$ -radiation at 0.03 Gy/sec. Just before irradiation, the rats were administered various antagonists of the two amines. The researchers found that evacuation began in the animals before the irradiation session had ended. The diarrhea stopped 40-50 minutes after the session. Plasma levels of serotonin and histamine rose during that period, peaking five minutes after the irradiation session and returning to control levels 30 minutes later. Results confirmed the literature data indicating that

endocrine and mast cells are the leading sources of serotoninemia and histaminemia. Serotonin antagonists peritol and dihydroergotamine (D blockers) and methoclopramide (an M blocker) prevented diarrhea in 50-70 percent of the rats to whom they were administered. Suprastine and cimetidine ( $H_1$  and  $H_2$  histamine-receptor blockers) also exhibited a marked antidiarrheal effect. In terms of protecting absorptive capacity, only cimetidine was consistently effective. Figures 1; references 33: 16 Russian, 17 Western.

**Study of the Activity of Carbohydrate Metabolism Enzymes of Bone Marrow Cells in Rats Subjected to Radiation Injury**

917C0361F Moscow RADIOPHYSICS in Russian  
Vol 30 No 5, Sep-Oct 90 (manuscript received 2 Feb 90)  
pp 619-622

[Article by B. F. Sukhomlinov, Yu. S. Grinyuk, N. A. Sibirnaya, L. S. Starikovich, and M. V. Khmil, Lvov State University imeni Iv. Franko]

UDC 577.391.612.419.577.15

[Abstract] A continuation of research on the molecular mechanisms underlying the effects of ionizing radiation on structural and metabolic processes in bone marrow cell populations, the work reported here involved a study of the effect of maximally lethal doses of x-radiation on the activity of lactate dehydrogenase, malate dehydrogenase, and glucosidase. It also involved a study of their relationships to one another in radiation sickness. After irradiating albino rats with a dose of 154.8 mC/kg at 0.258 mA/kg, the researchers found that in the unfractionated bone marrow of intact animals, the activity of all three enzymes was high, which indicates a substantial role in hemopoiesis. Lactate dehydrogenase was the most active of the three; malate dehydrogenase, the least active. The nature of the metabolic changes was found to be a function of radiosensitivity and functional specialization of myelokaryocytes, and the degree of the response of the metabolic processes to irradiation differed in the myeloid and erythroid populations. For example, the degree of suppression of enzyme activity varied as a function of the predominate type of energy exchange in the cells. The most sensitive of the enzymes to radiation effects was the dehydrogenase of the pentosephosphate cycle. References 16: 10 Russian, 6 Western.

**Impairment of Antitoxic Tetanus Immunity in Combined Radiation-Thermal Injury**

917C0361G Moscow RADIOPHYSICS in Russian  
Vol 30 No 5, Sep-Oct 90 (manuscript received 14 Aug 89) pp 623-626

[Article by O. I. Kurochkina and R. S. Budagov, Scientific Research Institute of Medical Radiology, USSR Academy of Medical Sciences, Obninsk]

UDC 577.391.612.01.017.1

[Abstract] Generalization of endogenous infection and wound infection is one of the leading causes of death in

combined radiation-thermal injury. There is, however, essentially no data in the scientific literature on the efficacy of emergency prophylaxis of tetanus in such injuries, and revaccination with the tetanus anatoxin is the only recognized method of preventing specific wound infection in injuries not aggravated by irradiation. In (CBA x C57BL6)F<sub>1</sub> mice, the researchers here determined the quantitative characteristics attending the antitoxic secondary immune response in combined radiation-thermal injury whose radiation component had varying degrees of severity. The mice were immunized subcutaneously with 5 EC of a commercial adsorbed tetanus anatoxin, and the radiation-thermal injury was modeled 18 days after the immunization (whole body irradiation, with IIIB burns over 10 percent of the body). Peak hemagglutinin levels were recorded on day 10. In mice irradiated with 4- and 6-Gy doses of  $\gamma$ -radiation (and subsequently burned), secondary immune response to the anatoxin was noted to decline, although average titers of the antitetanus hemagglutinins exceeded the norm at sublethal doses. Nonparametric analysis identified a statistically significant decline in the titers of the anatoxin in the dose range of 2-6 Gy. The researchers found a rather high radioresistance of secondary immune response in the mice immunized with the adsorbed anatoxin. They surmised that the impaired immune response may be associated with an expansion of the latent period and an extension of the productive phase of the response to the anatoxin, which would push peak antibody-formation back to a later point. It was suggested that the delayed rate of development of a secondary immune response in combined radiation-thermal injury may cause diminution of the body's resistance to tetanus when an infection process is under way in the first week after injury. Figures 2; references 10: 7 Russian, 3 Western.

#### Effect of Pesticides on Course of <sup>90</sup>Sr-Induced Osteosarcomas in Rats

917C0361H Moscow RADIobiologiya in Russian  
Vol 30 No 5, Sep-Oct 90 (manuscript received 9 Aug 89)  
pp 643-646

[Article by V. L. Shvedov, G. G. Anisimova, V. V. Ivanov, and L. P. Soroka, Institute of Biophysics, USSR Ministry of Health, Moscow]

UDC 577.391.578.088.91.599.323.4

[Abstract] In assessing long-term effects of exposure to <sup>90</sup>Sr and chronic ingestion of chlorofos and lindane, the researchers studied 1,200 albino rats divided into 12 groups of 50 males and 50 females each. The assessment criteria were incidence of osteosarcoma and change in average lifespan. Some of the rats received a single intraperitoneal injection of 11.1 kBq/g <sup>90</sup>Sr, and then varying amounts of the pesticides were placed in their drinking water. Some 45 percent of the rats administered <sup>90</sup>Sr (but not the pesticides) developed osteosarcoma. The addition of either chlorofos or lindane to such a regimen had little effect on the sarcoma incidence. First tumors appeared between day 219 and day 262, regardless of whether the <sup>90</sup>Sr administration was accompanied by

pesticide ingestion. The average lifespan of rats injected with the <sup>90</sup>Sr was half that of intact rats. Chronic ingestion of chlorofos, combined with the strontium, produced a potentiating effect, especially with males, whose average lifespans were shorter than those of the animals who had received only the <sup>90</sup>Sr. Lindane produced no such effect. The researchers concluded that chronic ingestion of the pesticides failed to exhibit carcinogenic or cocarcinogenic properties. References 12: 10 Russian, 2 Western.

#### Pharmacological Correction of Postirradiation Alterations of Algesia in Rats

917C0361I Moscow RADIobiologiya in Russian  
Vol 30 No 5, Sep-Oct 90 (manuscript received 20 Dec 89) pp 647-650

[Article by A. A. Abdurakhmanov and G. K. Aytikhzhina, Institute of Nuclear Physics, KaSSR Academy of Sciences, Alma-Ata]

UDC 577.391.599.323.4

[Abstract] Irradiation of animals at lethal and supralethal doses leads to various changes in algesia, depending on the nociceptive stimulus that is active. In the work reported here, the researchers studied the analgesic effect of morphine, promedol, buprenorphine, phentanyl, nalaxone, and D-Ala<sup>2</sup>Gly-ol<sup>5</sup> in irradiated outbred rats, and they assessed the role of  $\mu$ -opiate mechanisms observed in the algesia changes. The rats were tested before and after exposure to a dose of 150 Gy <sup>60</sup>Co  $\gamma$ -radiation at 4 Gy/sec for nociceptive response to thermal and electrical challenge. It was determined that the analgesic effect of the various drugs was a function of the initial state of nociceptive response. The shorter the duration of the latent period for the tail-flick test, for example, the more pronounced the suppression of that nociceptive response by the analgesic. It was also demonstrated that the level of drug-induced analgesia was subject to phase changes over the postirradiation period, with suppression of nociceptive response declining three to six hours after irradiation. The researchers noted a pronounced suppression of nociception by buprenorphine at hours one and six after irradiation. They concluded individual differences in analgesic effect between the morphine and the opioids are due to features of neurochemical, opioidergic mechanisms of pain regulation. Figures 2; references 5: 3 Russian, 2 Western.

#### Effect of Analgesics on Certain Hemodynamic Indices After High Doses of Irradiation

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Vol 30 No 5, Sep-Oct 90 (manuscript received 20 Dec 89) pp 651-654

[Article by A. A. Abdurakhmanov, Institute of Nuclear Physics, KaSSR Academy of Sciences, Alma-Ata]

UDC 577.391.599.323.4.591.111

[Abstract] Morphine and clofelin—which have different mechanisms of pain relief—produce marked analgesia in

rats that have been exposed to high doses of radiation. In light of the fact that high-dose irradiation alters hemodynamics, the researchers here studied the effects of analgesic doses of morphine and clofelin on arterial pressure and nociceptive response of arterial pressure in outbred rats exposed to whole-body irradiation by  $^{60}\text{Co}$   $\gamma$ -radiation in doses of 10 Gy (0.45 Gy/sec) and 150 Gy (4 Gy/sec). Before irradiation, morphine consistently produced no change in arterial pressure and increased the nociceptive pressor response of arterial pressure. Clofelin produced marked analgesia against the backdrop of hypertension—i.e., arterial pressure rose to a level 22 percent above that of control. It retarded nociceptive response. Morphine administration resulted in no changes in arterial pressure after irradiation at 10 Gy, although it did produce a slight drop in pressure at 150 Gy. In terms of nociceptive response of arterial pressure, morphine likewise produced no appreciable changes at either radiation dose level. At 10 Gy, clofelin raised blood pressure and suppressed nociceptive response. At the supralethal dose of 150 Gy, clofelin's effects were somewhat more complex. At hours three and six after irradiation, arterial pressure remained unaffected; at hour 24, hypertension was observed. At hour three, nociceptive shifts in hemodynamics were increased, whereas at hours six and 24, pressor response was suppressed. Figures 3; references 7: 6 Russian, 1 Western.

#### **Effect of Laser Acupuncture on Functional Indices of Mammalian Body**

917C0361K Moscow RADIobiologiya in Russian  
Vol 30 No 5, Sep-Oct 90 (manuscript received  
10 Apr 89) pp 671-674

[Article by V. M. Lupyr and N. G. Samoylov]

UDC 577.391:612.8.012.615.814.1

[Abstract] In light of the ever-increasing use of alternative medical treatments and the reports of positive effects from laser irradiation of organs and tissue, the researchers here chose to study the effect of laser irradiation of reflexogenic areas and acupuncture points on the electrical activity of the heart and skeletal muscles, on neuromediator response, and on physical fitness. The study was performed on Wistar rats ranging in age from one month to 24 months. The rats were placed in three groups: control (group I); three-month-old rats undergoing laser acupuncture paravertebrally at points corresponding to spinal segments Th<sub>12</sub>-L<sub>4</sub> and rats undergoing acupuncture at points he-gu and zu-san-li, which correspond to the fourth point on the meridian for the large intestine and the 36th point on the

meridian for the stomach in humans (group II); and rats performing physical exertion by running on a horizontal treadmill (group III). An LG-75 helium-neon laser operating in continuous mode at 632.8 nm was used. Exposition time was 15 seconds at each point. The experimental data indicated that laser acupuncture resulted in the accumulation of noradrenaline in the liver, which points to the trophic action of the sympathetic nervous system on liver tissue. The highest acetylcholinesterase activity was exhibited by neurons of the ventral and lateral horns of the spine. The 15-second exposure at he-gu and zu-san-li increased cardiac activity by quickening heart rate, shortening the R-R intervals, and dominating sympathetic activity. The researchers concluded in general that the acupuncture stimulated the heart, amplified the activity of the sympathetic part of the autonomic nervous system, produced functional changes in the brain, and elevated skeletal muscle response. References 25: 10 Russian, 14 Western, 1 Chinese.

#### **Effect of Alpha-Tocopherol on Proliferative Activity of Trunk Hemogenic Cells in Long Term Gamma Irradiation and Hyperthermia**

917C0569A Baku AZERBAYDZHANSKIY MEDITSINSKIY ZHURNAL in Russian No 7, Jul 90 pp 32-35

[Article by I. A. Gamzayeva, N. S. Gabay, and R. F. Yagubov, Scientific Research Institute for Epidemiology, Hygiene and Disease Prophylaxis]

UDC 612.41:577.161.3+615.849.5

[Abstract] The effect of  $\alpha$ -tocopherol on changes in the colony-forming elements of the spleen and their proliferative activity was studied in mice subjected to chronic and acute irradiation with or without hyperthermia (two hours at 40°C and 25-30 percent relative humidity). Administration of 5 mg  $\alpha$ -tocopherol one hour before irradiation was found to increase survival rates from 46.7-53.3 percent to 60.0-66.7 percent without hyperthermia, and from 40.0 percent to 46.7-53.3 percent with hyperthermia.  $\alpha$ -tocopherol also increased the number of endogenous spleen colonies and spleen mass. When bone marrow cells were transplanted from intact and irradiated mice to other, acutely irradiated mice,  $\alpha$ -tocopherol increased survival, particularly when the transplanted marrow was from unirradiated mice. This was not seen in transplants into chronically irradiated mice or those subjected to hyperthermia. Survival rate of 93.3 percent was achieved in acutely irradiated mice given bone marrow transplants from intact mice plus  $\alpha$ -tocopherol. References 6: Russian.

**Photoinduced Alterations of Transmembrane Transfer of Electrons in Erythrocytes**

917C0467E Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA FIZICHESKAYA in Russian Vol 54 No 8, Aug 90 pp 1643-1648

[Article by S. D. Zakharov, S. N. Perov, and N. A. Panasenko, Physics Institute imeni P. N. Lebedev, USSR Academy of Sciences]

UDC 621.373.826:571.08

[Abstract] Since the photodynamic effect is used in phototherapy for cancer, the photoinduced diminution of the reduction capacity of red blood cells can diminish their antioxidative activity against the decay products associated with the treatment. The aim of the work reported here was to determine the general patterns associated with electron transfer through the erythrocyte membrane at the initial stages of the photodynamic effect and to clarify the role of intracellular glutathione in those processes. After the redox capacity of erythrocytes obtained from fresh

heparinized blood was determined, redox potential was recorded on a Pt-AgCl electrode pair inserted into a cell suspension, and the photovoltaic response erythrocytes sensitized with hematoporphyrin diacetate. In the final stage of experiment, a platinum electrode initially charged to buffer solution potential was reduced by cells to a given value, and reduction time  $\tau_e$  was recorded. The parameter  $\tau_e^{-1}$  is directly proportional to the effective rate of electron transfer, which could have been effected when an exogenous oxidizer is reduced by the erythrocytes. The researchers found that, in the photodynamic effect, the membrane oxidoreductase systems of erythrocytes gradually increase the flow of electrons for the reduction of the oxidized products that are forming until there is a balance between the influx of oxidized forms and their reduction. The diminished level of intracellular glutathione in erythrocytes in the photodynamic effect stems from glutathione's participation in the chain of reduction of methemoglobin and oxidized SH-groups of membrane oxidoreductase proteins and the inhibition of lipid peroxidation, and not from its direct oxidation by singlet oxygen. Figures 3; references 22: 3 Russian, 19 Western.

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